



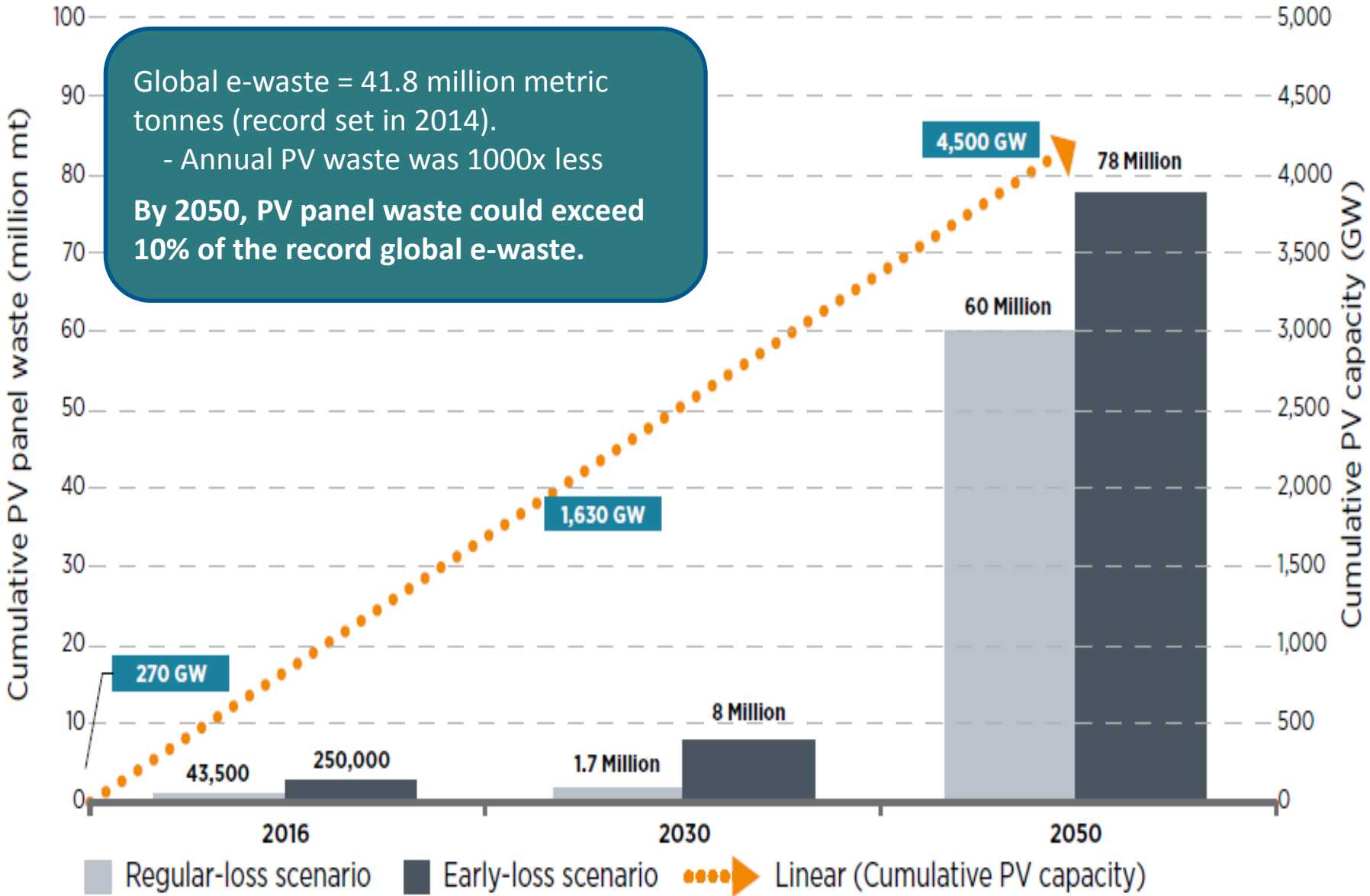
# Towards a R&D Roadmap for Crystalline Silicon Module Recycling

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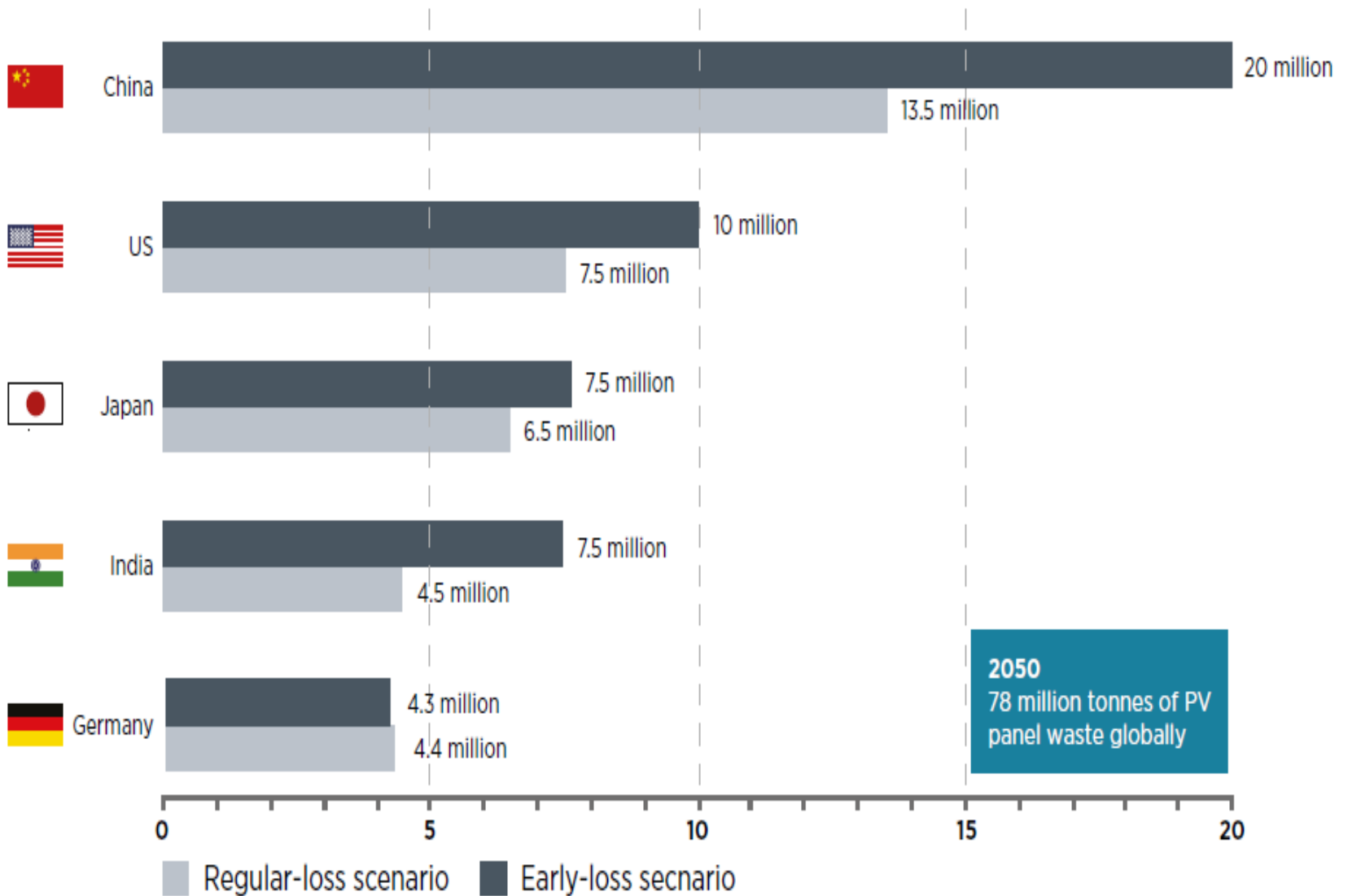
**WCPEC – PVPS Workshop  
Waikoloa, Hawaii**

# Low Volumes Now, PV Waste Will be Significant Challenge in Future



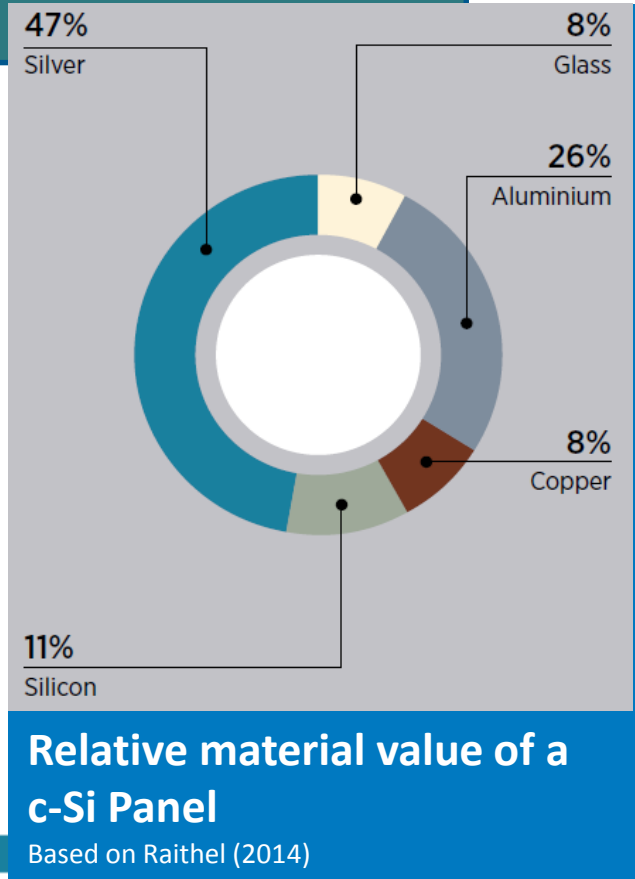
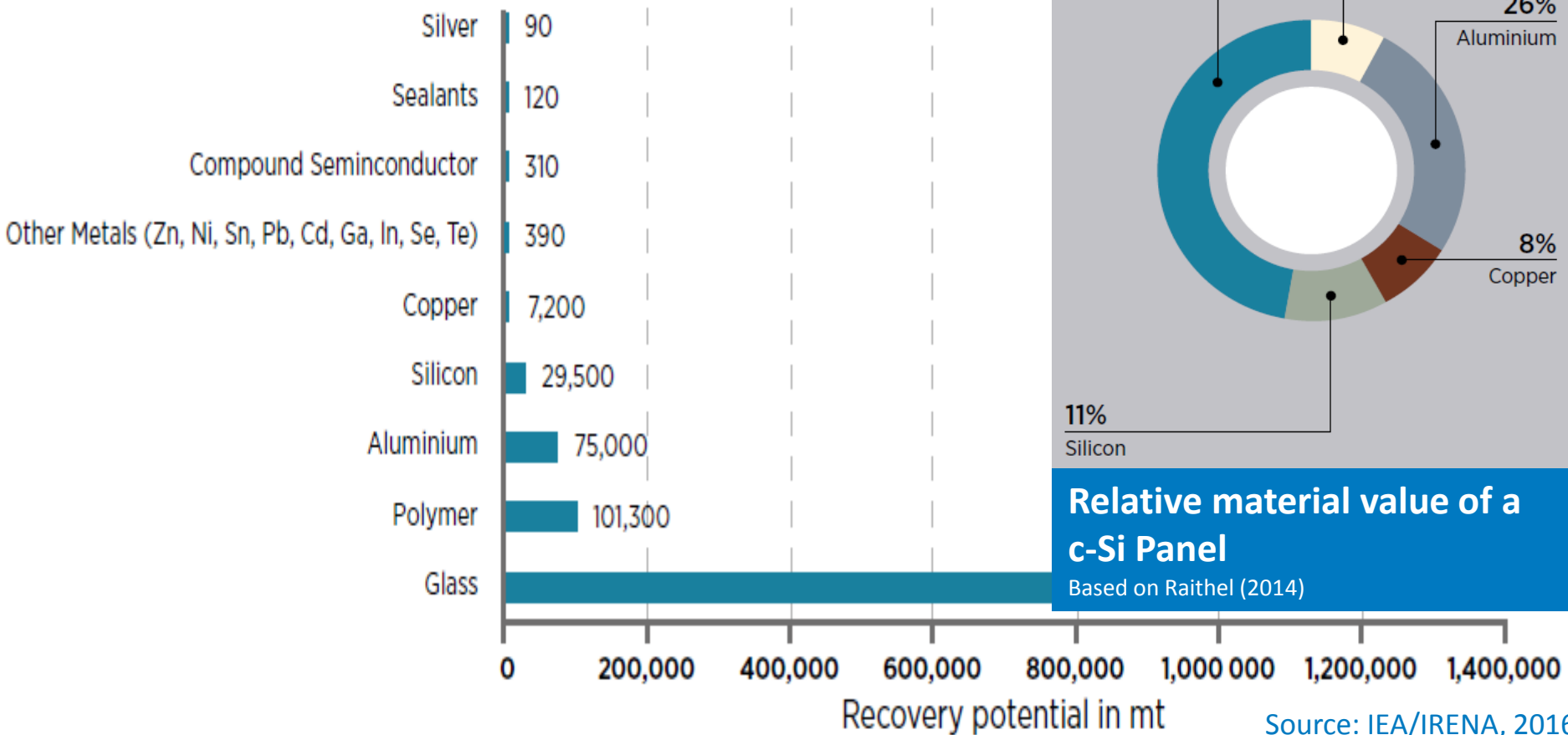
Source: IEA/IRENA, 2016

# USA Expected As Second Largest PV Waste Volume – Challenge and Opportunity



# Why Recycle Modules?

Cumulative technical potential for end-of-life material recovery (under the regular-loss scenario and considering anticipated changes to module design, like dematerialization)

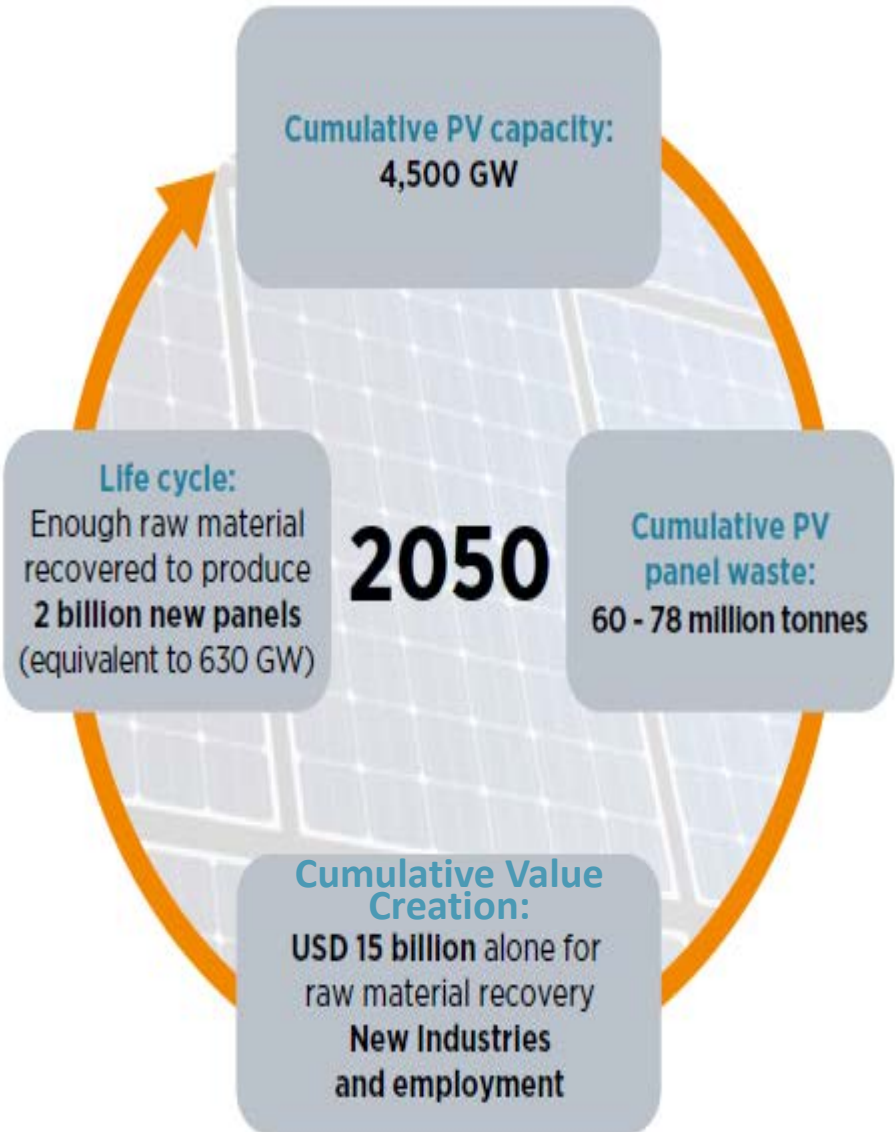
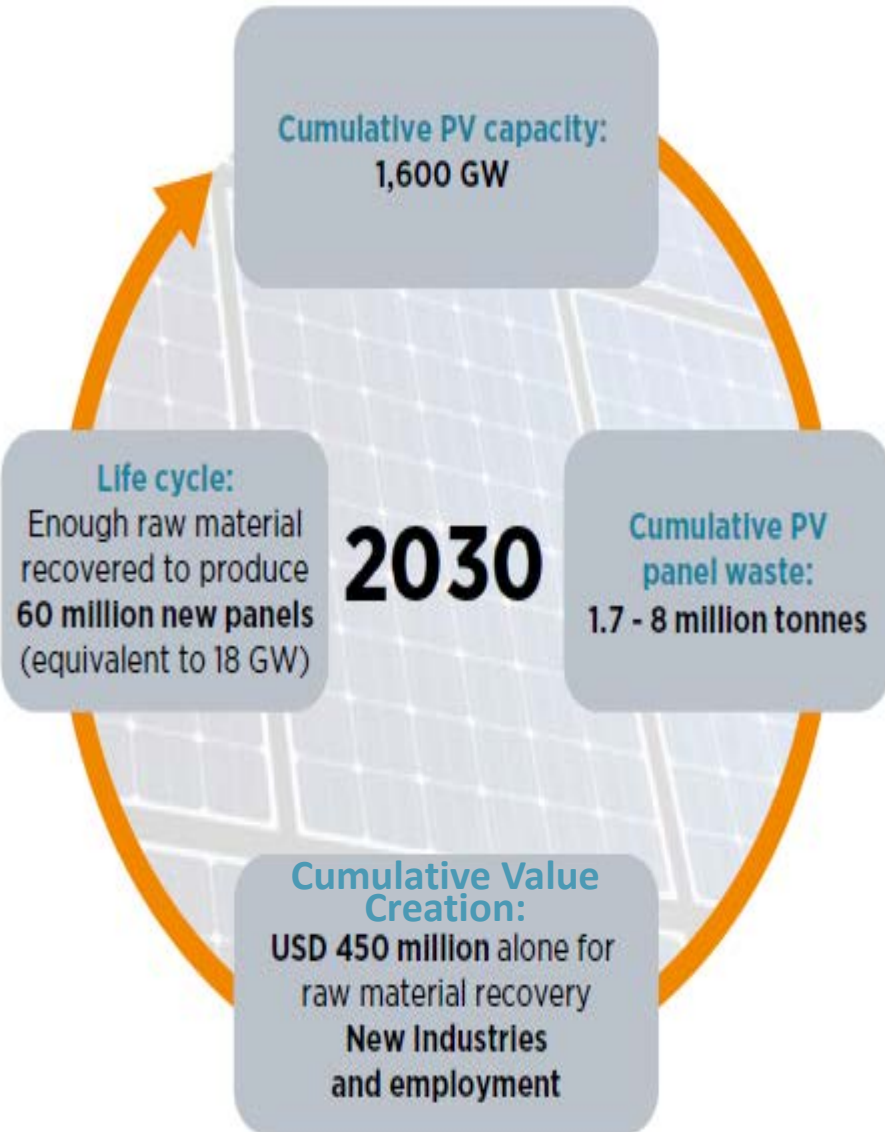


**Relative material value of a c-Si Panel**

Based on Raithel (2014)

Source: IEA/IRENA, 2016

# Potential Value Creation – A New Waste Management Industry?



# The Challenge for US PV Recycling

- Across all global markets, the US is projected to have the second largest amount of PV module waste.
- In the face of this daunting challenge, the infrastructure to handle the vast majority of this waste in such a way that maximizes value and materials recovery is immature.
- There are both market and technical challenges to creating a viable recycling industry for the largest market share PV technology, crystalline silicon, in the unique context of the US.

# Study Goals

- A c-Si recycling technology R&D Roadmap can prioritize appropriate research investments.
- And understand the major addressable challenges in PV recycling and advance research toward the recommended targets.
- Key outcomes of the Roadmap will be identification of technology drivers that can achieve both cost efficiency and high material recovery targets amongst the multitude of potential recycling processes that have been proposed to-date.

# Current Status

- Preliminary cost analyses of 2 advanced recycling processes will be presented
- We have only started to develop R&D suggestions based on these analyses
- This is the perfect time for input!