

# Solar Panel Recycling in The United States

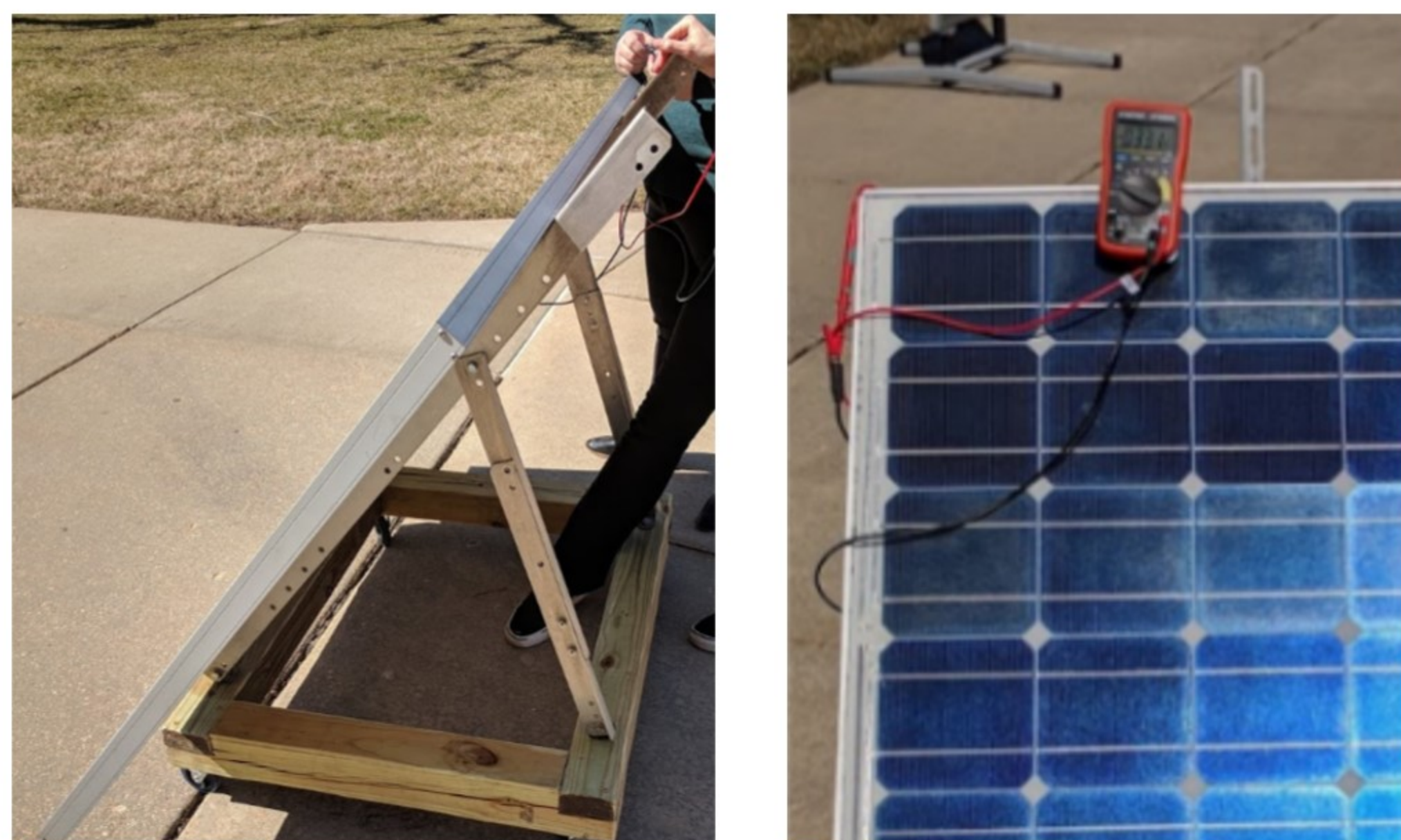
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## Introduction

- Solar panels are a beneficial growing renewable energy source.
- On average solar panels have a life span of 25-30 years.
- Decommissioned panels will contribute to a growing waste management problem that will impact the environment.
- By reducing, reusing, and recycling end-of-life panels, a reduction in hazardous waste in landfills is possible.

## Objectives

1. Review of the current Solar Panel Waste Management Systems across the United States
2. Create test procedures to evaluate PV panel viability and efficiency.
  - a) Position panel stand facing south
  - b) Mount PV panel
  - c) Set voltage and amperage on multimeter
  - d) Compare reading to manufacturing specifications

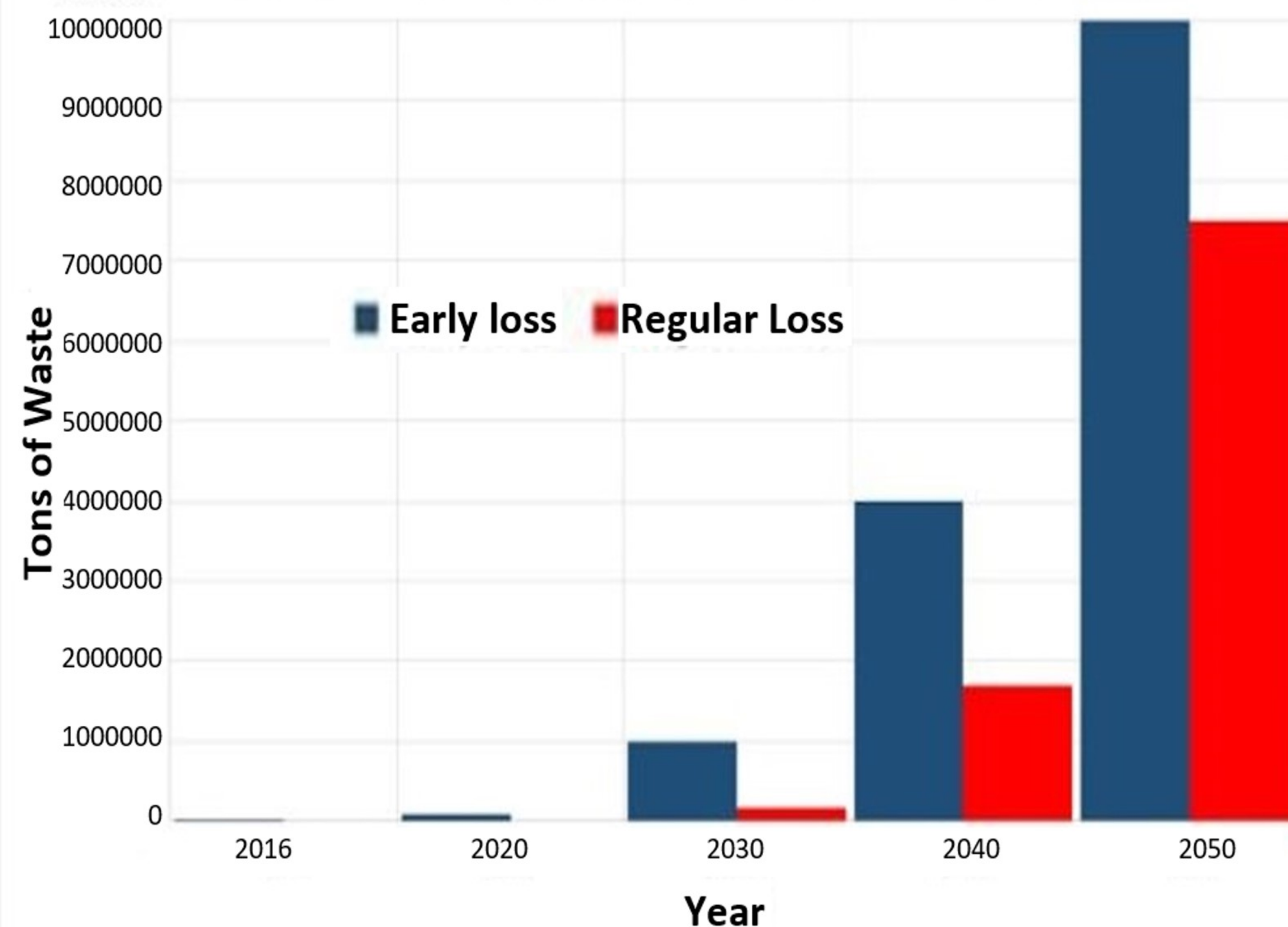


## References

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## Discussion

Estimated Cumulative Waste Volumes of end-of-life PV Panels in U.S.



## Impact

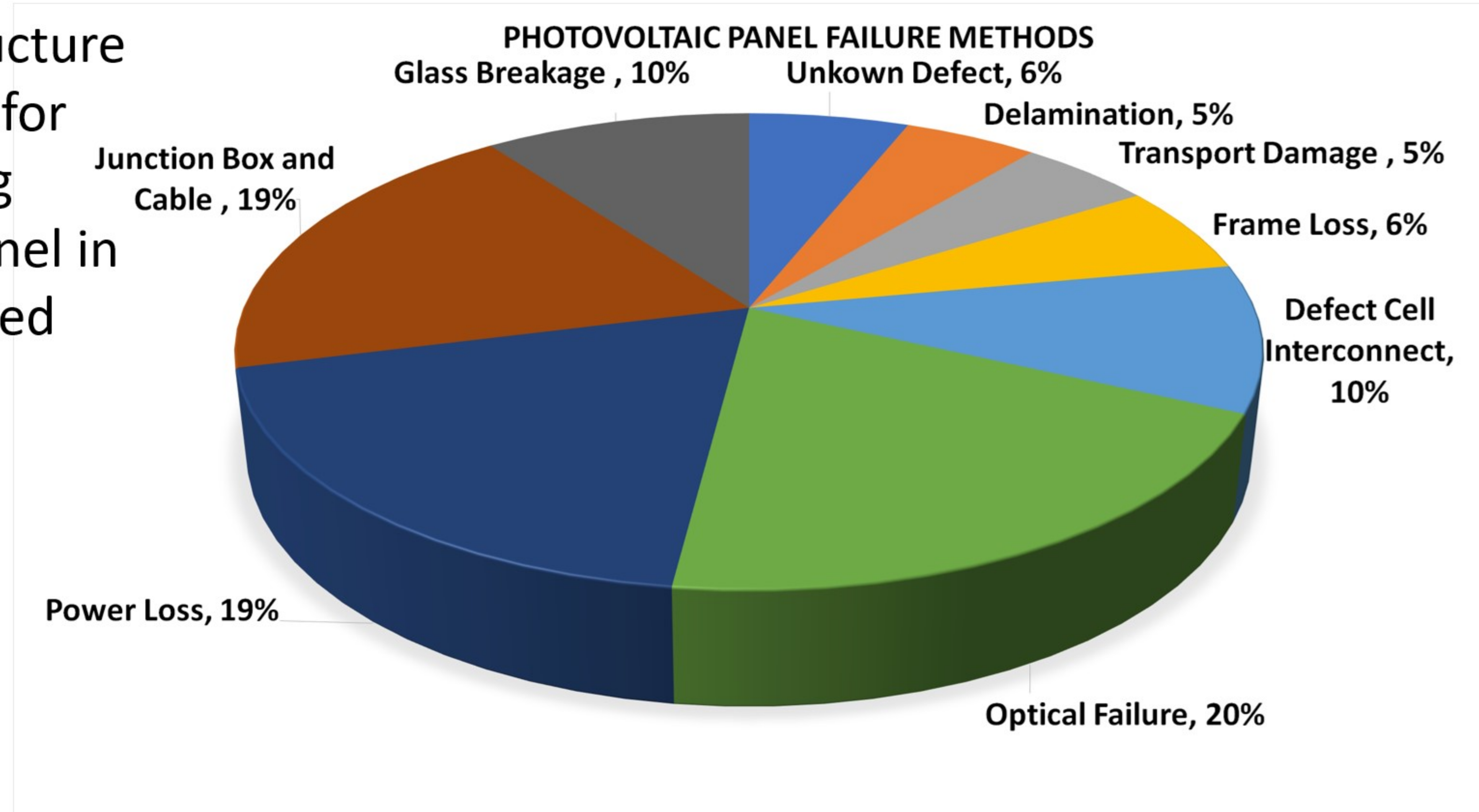
- Waste expected to approach 8 million tons annually in next 30 years.
- Recycling solar panels is expected to be a \$40 billion industry by year 2035.
- The waste contribution produced is from 2 to 8 g CO<sub>2</sub> eq/kWh.
- Valuable resources like precious metals and silicon are being lost resulting from discarding solar panels in landfills.
- These resources are estimated to be worth around 22 billion dollars combined in current panels.



- There was an estimated **196 million pounds** of PV waste in **2020**, equivalent to over **270 fully loaded jumbo jets**

## Challenges

- Solar panel installation rates and decommissioned amounts will continue to rise.
- Accessibility for end-of-life panels is few and far between, with only 2 companies in the U.S. being solely dedicated to recycling panels, as of 2019.
- Only 3 states, Washington, North Carolina, and New Jersey have implemented laws pertaining to solar panel waste.
- Panels often fail before their expected life span, creating more waste (early-loss scenarios).



## Conclusion/Solutions

- A review of current processing techniques has been shared and found the following:
  - New alternative methods for recycling PV panels needs to be
  - Panel manufacturers should prioritize design for disassembling and reduce raw material usage.
  - PV recycling industry is expected to become profitable when the incoming PV waste reached 19,000 tons/year.
- The level of the marginal capital cost of each PV take-back center, cost of reverse logistics, distance traveled, and the amount of PV waste collected from various locations need further development