

Meeting Summary: Solar Panel Recycling Commission

March 22, 2021 1:30 pm – 3:30 pm

Attendees

DEP: Dan Clark, Karen Kloo, Scott Brubaker, Nick Baier, Nick Nader, Ashia McRae

Non-DEP – Lyle Rawlings, Jim Entwistle, Dunbar Birnie, Joseph Ferante, Dr. Stephanie Lee,

Background:

- Solar panel installation began in the early 2000's in New Jersey (NJ).
- The first large scale project was a high school in 2004.
- Many solar panels are guaranteed to produce power for 25 year but often have a life of 30 to 35 years, or more.
 - Consequently, the first large scale solar panel disposal/recycling need is anticipated to occur around 2030.
- However, there is a current need to manage a more modest volume of damaged and defective solar panels.
 - Panels are damaged in transit, during installation, in accidents, building fires, and natural disasters.
 - Non-functional panels can result from quality issues.
- It is not mechanically possible to repair or refurbish damaged or defective solar panels.
- More advanced and efficient solar panels are seldom deployed to replace an older generation of panels due to the large capital investment associated with the initial installation.

Current Practices:

- Generally solar panels consist of 76% glass.
- Many damaged or defective are disposed of as solid waste.
- Current manufacturing process inhibits recycling of components because it is a difficult separation process to scrape layers off top of cell to separate plastics from glass.
 - There is no current expectation that the manufacturing process will change in near future to allow for ease of recycling.
- Hazardous Waste Constituents
 - Bulk of NJ solar panels are silicon, 160 microns thick.
 - A small fraction of solar panels installed in NJ contain cadmium, which is a couple of microns thick.
 - These cadmium solar panels may need to be managed separately from silicon panels.
 - There is no current expectation that the manufacturing process will change in near future to allow for ease of recycling.
 - There are existing specialized facilities and we should consider low-cost, aggregated transport to these existing specialized facilities
 - Commission can reach out to National Solar Energy Industry Association for additional expertise.

Solar Panel Manufacturers

- There are dozens upon dozens of manufacturers. Bloomberg maintains a list of 25 Tier-1 solar panel manufacturers.
- Solar panels are primarily foreign manufactured (Asia).

Ownership of Panels

- Currently over 120K homes in NJ with solar panels.
 - In NJ for last 5 years, 40% residential usage and the rest was on the utility and commercial scale
 - Majority (60-70%) of residential solar panels are third-party owned.
 - Homeowners enter contract (lease agreement) with third-party and third-party sells power to the homeowner.
 - Is there a standard industry-wide lease?
 - No, leases can vary. The Commission will review various leases used in NJ.
- Commercial and utility scale (solar farms) all are investor owned.
- BPU Clean Energy Website has solar panel installation data.

Who has the responsibility for end of life recycling of panels?

- The owner of the solar panel is responsible for replacement of damaged solar panels and end-of-life management.

Short- and long-term options

- Although not a settled issue, hazardous constituents are not expected to be of great concern because manufacturers have reduced or eliminated lead content in panels and solder. Only small number of panels have been manufactured with cadmium as a constituent.
- Panels are labeled at time of manufacturing; however, it is questionable as to whether a label will stay affixed during the life of the pane.
- Biggest issue is separation process. How to separate aluminum frame from plastic and glass? What to do with the silicon if anything?
- Managing panels as Universal Waste (UW). California has a program that began in January, 2021.
- Managing solar panels under an Enhanced Product Responsibility (EPR) Program.
 - Washington state has an EPR law.
 - Long life of panels may make an EPR Program not practicable.
 - Will manufacturer still be a viable party after 25-35 years?
 - Managing an advanced recovery fee program for 25-35 years may not be a viable option since the costs of recycling that far in the future would be difficult/impossible to predict.

Possible chapters for final report:

- Current Practices
- Viability of recycling panels as Universal Waste/Class D Materials
 - Downstream Markets
 - Status of California Program
- EPR
 - Funding
 - Status of Washington Program
- Innovative Recycling Options
 - Status of European solar panel recycling.

Deliverables for next meeting:

- Nick Nader: Review and report status of California panel recycling program.
- Karen Kloo: Review and report on managing solar panels as UW.
- Dunbar Birnie: Review and report on status of Europe (Germany) solar panel recycling programs. Use of cadmium solar panels in NJ.
- Jim Entwistle: Identify and report on downstream markets.
- Lyle Rawlings: Request sample leases and research and report on hazardous constituents.
- Joe Ferrante: Review and report on sample leases.
- Stephanie Lee: Review and report on newer recycling processing and technologies, chemical treatment.

Next meeting date agreed upon: Monday, April 26, 2021 at 1: 30 pm until 3: 30 pm