



Photovoltaic Solar Panels: End of Life and Recycling

By: Dennis McCarthy

Several public and private efforts are underway to address the “End of Life” issues of photovoltaic solar panels. Recycling initiatives in Europe and the United States are creating cash value opportunities for PV solar system owners. Also, system manufacturers are taking responsibility for reclaiming and repurposing the materials that make up this clean energy technology.

The Daily Green (1) reports on an emerging industry to recycle photovoltaic solar panels. Jennifer Woolwich of PV Recycling (8) has found the demand for recycling from customers/users and manufacturers of PV solar panels rising. Speaking of manufacturers, Woolwich said "Of those we (PV Recycling) interviewed, 100 percent want recycling." "Eighty percent want an independent third-party doing the recycling." (1) Some firms like Solar World prefer to keep the technology know how in house and do the recycling themselves. The PV Recycling web site reports a list of recycling opportunities that include:

- Waste from aluminum frames can be transformed into raw materials for new frames, truly a cradle to cradle process.
- Silicon can be reclaimed and reintroduced into cell production.
- Solar panels are made of up to 90% glass and may be easily recycled and repurposed in a number of different ways.

Crystalline photovoltaic is the oldest and most widespread solar technology in the United States, holding 57 percent market share. "As far as hazardous materials go, you're primarily talking about lead," according to Dustin Mulvaney, a University of California, Berkeley scientist and he serves as a consultant to the Silicon Valley Toxics Coalition. (1)

In an article entitled End-of-life PV: then what? - Recycling solar PV panels the author, (2) Kari Larson, reports that PV modules contain substances such as glass, aluminum and semiconductor materials that can be successfully recovered and reused, either in new photovoltaic (PV) modules or other products. As the demand for photovoltaic solar panels rises the industry will look to reuse materials from obsolete products.

There are costs associated with recycling and companies are planning ahead. Some manufacturers are anticipating these costs and have established annuity programs, escrow accounts, maturity bonds, annual fixed contracts, and pay as you go. The costs will vary depending upon the method used to collect the panels. The Brookhaven National Laboratory (4) stresses the importance of taking down and collecting the PV panels before the recycling can begin. Go to reference source #2 cited below for a



presentation of three models. The free market will continue to determine the cost of recycling until the Federal or State government mandates recycling and establishes standards and process regulations.

Driving entrepreneurs to this emerging industry is the value of recycled components. GlobalData (5) estimates the size of the recycled crystalline modules business at \$12.9 billion by 2035. Alternative uses of materials and evolving recycling technologies are accelerating the growth of this market.

Silicon Valley Toxics Coalition (6) released the results of its survey on 15 of the largest PV solar manufacturers in the spring of 2011. Findings from the Solar Scorecard, as reported by The Los Angeles Times (7,) reveals that 13 of the 15 companies conducted audits and monitored their supply chain for environmental, health and safety issues. Eleven companies said they would be in favor of a law that requires manufacturers to take back their panels at the end of their useful life.

As PV solar panel system manufacturers recognize the importance of maintaining a positive image in a clean technology industry and entrepreneurs are driven to commercialize recycling opportunities the future of managing “end of life” issues for PV Solar panels seems favorable.

- (1) <http://www.thedailygreen.com/environmental-news/latest/solar-panel-recycling-460810>
- (2) <http://www.renewableenergyfocus.com/view/3005/end-of-life-pv-then-what-recycling-solar-pv-panels/>
- (3) <http://www.pvcycle.org/#>
- (4) <http://www.bnl.gov/world/>
- (5) <http://www.prlog.org/11770435-solar-module-recycling-necessary-step-to-maximize-environmental-benefits-of-solar-pv-industry.html>
- (6) <http://svtc.org/>
- (7) <http://latimesblogs.latimes.com/greenspace/2011/04/solar-panel-manufacturing-and-disposal-is-it-green-and-safe.html>
- (8) <http://www.seia.org/policy/environment/pv-recycling>