



Information Sheet: Solar Decommissioning

Question: Does our county need to think about mitigating solar as a hazardous waste at the time of decommissioning?

Answer:

As more and more solar projects move through the siting process, we are hearing more questions from local units of government about how they should approach and plan for future decommissioning of a solar installation. A recent question specifically pointed to the question of whether or not decommissioning of a solar installation should require a "toxicity bond."

To start, let's explain what a toxicity bond is. A toxicity bond is a requirement local government authorities may impose on companies that use hazardous materials in their operations and/or facilities. The local government unit requires the companies to post a surety or cash bond to help cover the cost of cleaning up hazardous wastes at abandoned or decommissioned facilities. Of note in this description is that these bonds are intended to address *hazardous* waste, not solid waste.

That's the next point! Solid waste vs. hazardous waste. Which applies to solar arrays?

End-of-life disposal of solar products in the US is governed by the Federal Resource Conservation and Recovery Act (RCRA) and state policies that govern waste. Under RCRA, the burden is on the solar panel manufacturer to determine if the waste being generated (the solar panels and inverters) is hazardous or not. This determination can be made using a materials "knowledge" test (i.e., cross referencing a sheet listing the materials used in the manufacture of the panels with RCRA-listed hazardous wastes) or the easier way: simply performing toxicity testing (i.e., the Toxicity Characteristic Leaching Procedure test - TCLP Test).

If a panel is tested and passes the TCLP, then it is regulated as normal solid waste; if it fails the TCLP then it is regulated as a hazardous waste and state and federal requirements apply. Most panels pass the TCLP test, and thus are classified as non-hazardous and are not regulated as toxic material. However, if the solar panel is determined to be hazardous due to the presence of metal-bearing circuit boards, the circuitry components, when decommissioned, can be routed through electronics recycling programs that are available in each county of the state as required by Minnesota regulation (see Minn. Admin Rule Chap. 9215).

Question: Ok, but beyond just classifying things as a waste stream, won't there be some sort of value for these systems down the road through recycling?

Answer:

All solar panels contain at least one rare or precious metal: tellurium, silver or indium, and often several, which makes it likely that they will be recycled at the end of their working life, which is at least 20 to 30 years. Currently, there is little recycling infrastructure for recycling solar panels because there simply is not enough volume.



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Most solar panels installed 20-30 years ago are still performing well enough *not* to decommission them (and some are still flying around the universe on satellites!). It is probable that decommissioned solar panels may never see a landfill because their material recovery would be too valuable. Annual PV waste is not expected to exceed 100,000 tons nationwide until after 2017. The viability of a recycling program depends on sufficient waste stream and there are simply not enough decommissioned panels to create a recycling market in the near term. Regardless, many panel manufacturers do operate recycling and take-back programs for their products. In addition, many panel manufacturers adhere to ISO 1400 (environmental management standards) and ISO 2600 (corporate social responsibility) and participate in [PV Cycle](#), a European solar recycling and waste recovery program.

A 2016 report by the International Renewable Energy Agency (IRENA) and the International Energy Agency's Photovoltaic Power Systems Programme projects the market for recycling or repurposing solar photovoltaic (PV) panels their raw materials and components could be exceed \$15 billion by 2050.

<http://www.irena.org/menu/index.aspx?mnu=Subcat&PriMenuID=36&CatID=141&SubcatID=2734>

Sources:

- Natl. Geographic: <http://news.nationalgeographic.com/news/energy/2014/11/141111-solar-panel-manufacturing-sustainability-ranking/>
- Silicon Valley Toxics Coalition: http://svtc.org/wp-content/uploads/Silicon_Valley_Toxics_Coalition_-_Toward_a_Just_and_Sust1.pdf
- EPA Memo: [https://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/E00965CB6BC4E595852567BA00708BAA/\\$file/12127.pdf](https://yosemite.epa.gov/osw/rcra.nsf/0c994248c239947e85256d090071175f/E00965CB6BC4E595852567BA00708BAA/$file/12127.pdf)
- SEIA: <http://www.seia.org/policy/environment/pv-recycling>
- PV Cycle: <http://www.pvcycle.org.uk/>
- EPA Financial Assurance Requirements for Hazardous Waste: <https://www.epa.gov/hwpermitting/financial-assurance-requirements-hazardous-waste-treatment-storage-and-disposal>
- MN Administrative Rules on Hazardous Waste - Chapter 7045 <https://www.revisor.mn.gov/rules/?id=7045>
- Minnesota Pollution Control Agency, How to determine if an item is hazardous waste: <https://www.pca.state.mn.us/sites/default/files/w-hw1-01.pdf>

This information is intended to help inform Minnesotans on key issues related to solar energy. The responses were compiled based on questions CERTs received from local jurisdictions. The responses are not intended to be a one-size-fits-all set of recommendations, as local context will inform local decision making. If you have any questions or would like to discuss the topics herein, please contact Lissa Pawlisch at pawl0048@umn.edu or 612-624-2293.