Harmony Solar ND, LLC
Harmony Solar Project
Docket No. PU-18-219

Late-Filed Exhibit No. 12 – Information on Solar Panel Disposal

At the public hearing, the Commission requested information regarding disposal/recycling of solar panels. Attached is a 2018 brochure prepared by the Solar Energy Industries Association ("SEIA") regarding the proactive plans for waste management of the photovoltaic ("PV") cells used in solar panels for energy generation. Geronimo Energy, who is assisting Harmony Solar ND, LLC with development of the Harmony Solar Project, is a member of SEIA.

PV Waste 101

The Solar Industry's Proactive Plan for Waste Management

What are Photovoltaics?

Photovoltaic (PV) cells are the most common technology used in solar energy generation. Panels made of PV cells act as semiconductors, converting sunlight into electricity for home, commercial and industrial use.

What is the Solar Industry's Current Position on Recycling?

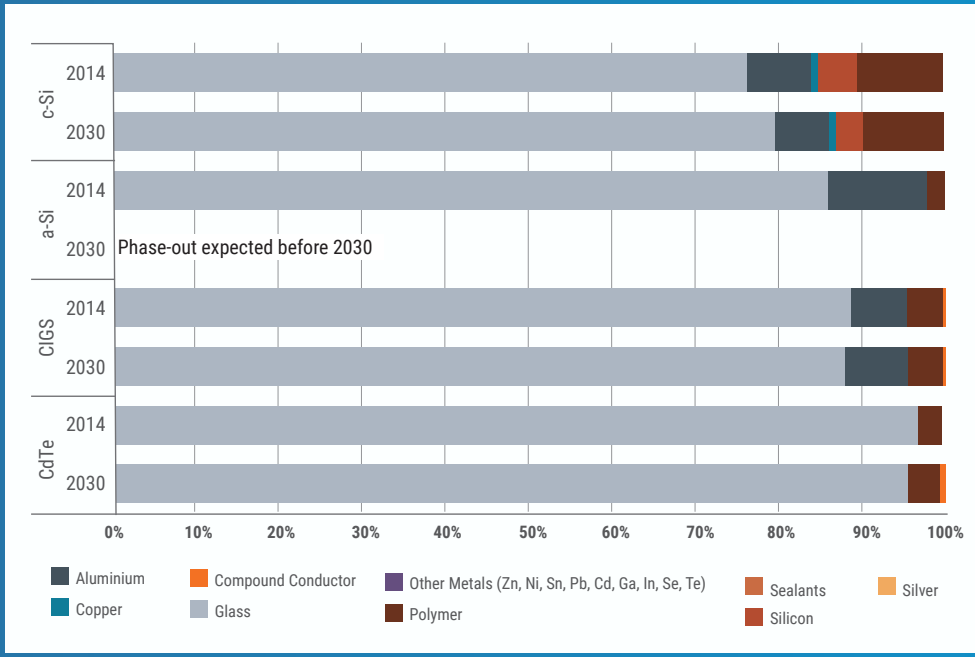
The falling cost of solar in recent years has made renewable energy accessible to more people than ever before and has resulted in an exponential increase in solar adoption. With over 400 gigawatts (GWdc) of PV modules installed globally, recycling is important for all PV technologies to ensure clean energy solutions do not pose a waste burden for future generations.

Although most PV panels produced today will have a useful life for decades, there is inevitable waste created when panels are damaged during shipment or installation, determined to be defective, become obsolete or reach their end-of-life. High-value recycling can help minimize life cycle impacts and recover valuable and energy-intensive materials, thereby increasing sustainability within the PV industry.

A state-of-the-art, integrated recycling network for PV panels and other solar products ensures responsible end-of-life disposal and is a key element of a responsible transition to a clean energy economy.

What is the Material Content of PV?

PV panels typically consist of glass, aluminum, copper, and semiconductor materials that can be successfully recovered and reused in new PV panels and other products at the end of their useful life. By weight, more than 80 percent of what goes into PV panels is glass and aluminum – both common and easy-to-recycle materials. The image on the right displays the material composition of an average PV panel.



Source: IRENA and IEA-PVPS (2016), "End-of-Life Management: Solar Photovoltaic Panels," International Renewable Energy Agency and International Energy Agency Photovoltaic Power Systems.

What is the Role of SEIA and its Members?

Members of the Solar Energy Industries Association® (SEIA) are committed to responsible end-of-life management and are proactively developing best practices for the industry. Some SEIA members operate take-back and recycling programs for their products. Many of SEIA's solar manufacturers and developers – including Canadian Solar, First Solar, Flex, JinkoSolar, SunPower, Panasonic and Trina Solar – are working together to create a network of recyclers who can properly handle PV waste and ensure waste is not sent to landfills. By pooling our resources and proactively developing a PV waste management infrastructure, the solar industry will have the cost-effective PV recycling solutions.

> **A state-of-the-art PV recycling network is a key element of a responsible transition to a clean energy economy**

How is Management for PV Waste Different from Consumer Electronics?

Many consumer electronics have short lifetimes and high disposal rates, which can pose a serious waste management challenge. Conversely, solar panels can last for decades, with 20-25 year warranties and useful life estimates adding another 10-20 years. In fact, less than 1% of PV currently in existence needs to be disposed of annually. In contrast to the more mature and saturated consumer electronics market, the PV industry is still in a relatively early stage. Because of this, PV waste volume will remain relatively low for many years to come, which gives the solar industry an opportunity to establish a proactive waste-management infrastructure. Although PV recycling processes may vary by technology, proven industrial-scale recycling processes have been developed for all PV panel technologies, including crystalline silicon and thin film.

How is the Industry Proactively Planning to Deal with Future PV Waste?

SEIA works with existing industry / commercial recyclers to familiarize them with the solar technology, help them adjust their processes and equipment to recycle PV products. SEIA also works with new PV recycling companies who would like to maximize the recovery of valuable materials from PV modules. For members, SEIA aggregates the services offered by recycling vendors to obtain more advantageous pricing and service arrangements. By working with both recyclers and manufacturers, SEIA is making it easier for industry to select a cost-effective and environmentally responsible end-of-life management solution.

Further, SEIA actively works with members and legislators on proactive waste management policies and strategies in an effort to make the entire industry landfill-free. These efforts include developing the national recycling network, investing in research and development for recycling technologies, and collaborating on policies and regulations that positively contribute to a long-term global circular economy.

For more information on SEIA's sustainability and recycling efforts, contact:

Evelyn Butler
Senior Director, Codes & Standards
ebutler@seia.org
(202) 681-4156

For all media inquiries, contact:

Alexandra Hobson
Director of External Communications
ahobson@seia.org
(202) 556-2886