NSF Convergence Accelerator

NSF Convergence Accelerator's 2022 Cohort Phase 2 Award

Project Title
Securing critical material supply chains by enabling phOtovoltaic circuLARity (SOLAR)

Awardee
Battelle Memorial Institute

Award/Contract
49100424C006

Award Contract Type
R&D

Award Date
December 21, 2023

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NSF Funded Program
NSF Convergence Accelerator

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PROJECT ABSTRACT

Solar panels are a significant part of today's energy landscape, and U.S. solar capacity is growing to meet the clean energy transition goals. However, this growth brings a challenge: between 2030 and 2060, an estimated 9.8 million metric tons of solar panel waste will accumulate. Around 90% of end of life or defective solar panels are sent to landfills, largely because landfilling is five times more cost-effective than recycling. Further, by 2050 the value of raw materials recoverable from solar panels could exceed $15 billion. Incentivizing and enabling solar materials circularity with transparent, next-generation supply chains will greatly accelerate the transition to an equitable clean energy economy while minimizing strains on domestic supply chains for critical materials. The NSF Convergence Accelerator's funded SOLAR project (Securing critical material supply chains by enabling phOtovoltaic circuLARity) will converge research across institutions and disciplines to provide a comprehensive toolkit to provide solutions to circularity barriers throughout the supply chain. SOLAR is led by Battelle Memorial Institute with partner institutions including the National Renewable Energy Laboratory (NREL), the Electric Power Research Institute (EPRI), Texas A&M University's Energy Institute, Equitable Solar Solutions, and Southern Company. SOLAR will proactively ensure circularity of solar panels before waste accumulates at large rates in several decades, ensuring a smooth transition to a clean energy system in the U.S.

The SOLAR project will provide a toolkit to stakeholders by innovating in three outcome areas: (1) improve module end of life management by developing key tools for detection and sortation, reducing hazardous waste impacts, and training a new workforce for module repair and decommissioning, (2) develop upcycling technology for silicon and critical materials to improve recycling costs and help stabilize domestic supply chains, and (3) build a groundbreaking modeling tool to account for photovoltaic recycling impacts across supply chains and communities. The SOLAR toolkit will be constructed through a variety of methods such as working groups, industry-driven integration council feedback, model development and user testing, and technology development. In alignment with the broader goals of the NSF Convergence Accelerator, SOLAR can be used as a case study and blueprint for circularizing other material economies.