

The U.S. Department of Energy SunShot Initiative is a collaborative national effort to make solar energy technologies cost-competitive with traditional forms of energy by the end of the decade. Reducing the total installed cost for utility-scale solar electricity to roughly 6 cents per kilowatt hour without subsidies will result in rapid, large-scale adoption of solar electricity across the United States. Reaching this goal will re-establish American technological leadership, improve the nation's energy security, and strengthen U.S. economic competitiveness in the global clean energy race.



Mesa Verde National Park in Colorado is the home of this PV array, where it provides energy for the visitor center. Photo Courtesy: Department of Energy

Photovoltaics

The U.S. Department of Energy (DOE)'s Solar Energy Technologies Office works with industry, academia, national laboratories, and other government agencies to advance solar photovoltaics (PV), which is the direct conversion of sunlight into electricity by a semiconductor, in support of the goals of the SunShot Initiative. SunShot supports research and development to aggressively advance PV technology by improving efficiency and reliability and lowering manufacturing costs. SunShot's PV portfolio spans work from early-stage solar cell research through technology commercialization, including work on materials, processes, and device structure and characterization techniques.

With the goals of the SunShot Initiative in sight, SunShot's PV program is also addressing challenges beyond SunShot. As deployment levels increase, the price of PV electricity must decline even further to enable high penetration into electricity markets. Achieving a levelized cost of electricity (LCOE) of \$0.02-0.03/kWh by 2030 would allow for costs of several cents per kWh to address dispatchability and grid performance while maintaining cost competitiveness.

SunShot's PV Research & Development Portfolio

DOE issues competitive solicitations, or funding opportunity announcements, to fund targeted research projects along the entire PV technology pipeline. Financial awards in the following programs allow key partners—industry, laboratories, and universities—to help DOE advance toward and beyond the SunShot Initiative goals.

Lowering Manufacturing Costs & Improving Efficiency of Photovoltaic Cells and Modules

BRIDGE

The Bridging Research Interactions through collaborative Development Grants in Energy (BRIDGE) funding program supports collaborative research teams to significantly lower the cost of photovoltaic systems. The teams can access the tools and staff expertise at DOE Office of Science research facilities so fundamental scientific discoveries can be rapidly transitioned to existing product lines and projects. By leveraging these facilities,



Crews install PV panels at the National Renewable Energy Laboratory's Research Support Facility. Photo Courtesy: Department of Energy



This PV array in Lake Powell, Utah provides electricity to Dangling Rope Marina, replacing diesel-fueled power generators. Photo Courtesy: Department of Energy

BRIDGE researchers have access to x-ray and neutron scattering, nanoscale science, advanced microcharacterization, environmental molecular sciences, and advanced scientific computing.

DISTANCE

The SunShot Diversity in Science and Technology Advances National Clean Energy in Solar (DISTANCE) funding program aims to drive solar innovation among groups currently underrepresented in science, technology, engineering, and math (STEM) in order to develop a more diverse and inclusive solar energy workforce and integrate more solar into the U.S. electricity supply.

F-PACE 1 & 2

The Foundational Program to Advance Cell Efficiency (F-PACE) funding program aims to increase the efficiency of photovoltaic (PV) cells achieved in the laboratory and on manufacturing lines. The first round of the F-PACE program supported 18 research projects over a 36-month performance period. These efforts laid the technical foundation for significant increases in PV efficiency by identifying cost and efficiency barriers and researching PV materials and processes. Through the second round of this program, four collaborative research teams are working to define and fabricate model systems that can approach theoretical power conversion efficiency limits for a chosen bandgap and absorber material.

Next Generation Photovoltaics 1, 2 & 3

The Next Generation Photovoltaics funding programs support projects that are investigating transformational PV technologies with the potential to reduce costs to and beyond the SunShot targets. The projects' goals are to increase efficiency, reduce costs, improve reliability, and create more secure and sustainable supply chains. These research and development projects explore a spectrum of leading-edge solutions, from new high-performance materials like perovskites to novel techniques for creating solar cells with high efficiencies and lower manufacturing costs.

National Center for Photovoltaics

The National Center for Photovoltaics (NCPV) at the National Renewable Energy Laboratory is the largest recipient of PV research funding from SunShot. The NCPV focuses on technology innovations that drive industry growth in U.S. PV manufacturing, and it is a central resource for our nation's capabilities in PV research, development, deployment, and outreach. Research spans a breadth of technology areas, including crystalline silicon, CdTe, CIGS, III-V, emerging thin film technologies, and advanced measurements and characterization. The NCPV also provides accredited measurements that support the PV community with independent verification of PV cell and module efficiencies.

Improving Photovoltaic Reliability and Durability

PREDICTS 1&2

The Physics of Reliability: Evaluating Design Insights for Component Technologies in Solar (PREDICTS) funding program takes a physics-based approach to understanding degradation and failure modes for PV products. The program supports the identification, evaluation, and modeling of intrinsic degradation mechanisms, as well as improvements in the ability to predict performance over PV system lifetime, to reduce the perceived risk of PV technology.

National Lab Performance and Reliability

The SunShot Initiative funds R&D and standards work at NREL and Sandia to improve confidence in PV performance and reliability and to better understand degradation mechanisms. Goals of this work are to decrease the perceived risk of investing in PV projects and to increase PV energy yield. This includes funding for the International PV Quality Assurance Task Force (PVQAT), as well as the Regional Test Centers, which are five geographically diverse centers that validate the performance and support commercialization of PV technologies.

Funding Opportunities

For more information on open funding opportunities, visit the SunShot Initiative's financial opportunities webpage: energy.gov/eere/sunshot/financial-opportunities.

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