ADVANCED SOLAR TECHNOLOGY AWARD SELECTIONS FOR THE SUNSHOT INITIATIVE - By State

Sept. 1, 2011

Awardee Name	City	State	Award Amount	Brief Project Description	Award Category
Amonix	Seal Beach	CA	$4,474,000	Project will develop new dual-axis tracking systems specifically for concentrating PV systems.	Extreme Balance of Systems Hardware Cost Reductions
California Institute of Technology	Pasadena	CA	$750,000	Project will develop a flexible, low-cost, wire-array solar cell. Layers of high-efficiency semiconductor materials will be used to form dual- and triple-junction PV devices.	Next Generation PV II
Clean Power Finance	San Francisco	CA	$3,000,000	Project will develop an open-source, online information technology (IT) platform that will consist of a database of PV permitting requirements by the authorities that have jurisdiction, in addition to complementary turnkey IT solutions for installers and electric utility companies.	Market Barriers and Non-Hardware Balance of System Costs
Halotechnics	Emeryville	CA	$1,000,000	Project will develop a thermal energy storage system operating at 700°C using a new high-stability, low-melting-point molten salt as the heat transfer and thermal storage material, and demonstrating unprecedented efficiency for concentrating solar power applications.	SunShot Incubator
PLANT PV	Berkeley	CA	$750,000	Project will study the feasibility of using cadmium selenide as the top cell and silicon as the bottom cell in a tandem architecture.	Next Generation PV II
Renewable Power Conversion	San Luis Obispo	CA	$793,325	Project will develop an advanced PV inverter technology, enabling reduced levelized cost of electricity through maximized system efficiency and a true 25-year lifetime.	SunShot Incubator
Sandia National Laboratories	Livermore	CA	$749,853	Project will develop a new class of PV material, crystalline nanoporous frameworks, which will allow detailed control of key interactions at the nanoscale.	Next Generation PV II
SolarTech	San Jose	CA	$2,500,000	Project will develop a scalable national platform to develop model codes, standards, rules, and processes that will enable reduced time frames for PV installations and deployment at lower cost.	Market Barriers and Non-Hardware Balance of System Costs

Stanford University	Stanford	CA	$1,380,470	Project will develop an efficient upconverting material (one that can increase the energy of a stream of light) for incorporation into commercial solar cells using computational and experimental techniques.	Next Generation PV II
Tigo Energy	Los Gatos	CA	$3,026,000	Project will advance to pilot production a new, low-cost, direct-current, arc-fault detector, which enhances the safety of PV arrays, reduces ongoing operations and maintenance costs for system owners, and complies with all applicable codes and standards for new and retrofit applications in residential, commercial, and utility-scale systems.	SunShot Incubator
University of California, Berkeley	Berkeley	CA	$1,500,000	Project will grow high-quality microstructures of high-efficiency semiconductors on low-cost substrates.	Next Generation PV II
University of California, Irvine	Irvine	CA	$1,422,130	Project will develop a 10%-efficient prototype solar cell made from nontoxic, inexpensive, and Earth-abundant iron pyrite (also known as fool's gold), which offers a clear pathway to 20% PV module efficiency.	Next Generation PV II
University of California, Los Angeles	Los Angeles	CA	$1,500,000	Project will identify and develop a new high-efficiency material system for solar cells via experimental analysis supported by modeling.	Next Generation PV II
Zep Solar	San Rafael	CA	$919,626	Project will develop innovative structural components for ground-mount applications as an extension of their work in mounting hardware for commercial PV systems.	Extreme Balance of Systems Hardware Cost Reductions
Solexel and Owens Corning	Milpitas Granville	CA OH	$12,967,200	Project will develop a building-integrated PV roofing shingle and installation accessories for residential sloped-roof applications.	Extreme Balance of Systems Hardware Cost Reductions
California Total			**$36,732,604**		
Colorado School of Mines	Golden	CO	$1,484,364	Project will develop new approaches to create nanocrystalline-silicon materials to explore and exploit hot carrier collection (which creates high-energy electrons) as a way of significantly boosting the efficiency of nanoscale PV films.	Next Generation PV II
Colorado State University	Fort Collins	CO	$1,500,000	Project will develop barrier layers in cadmium-telluride PV devices. The research provides a path to increase PV cell efficiency while also being applicable to manufacturing processes.	Foundational Program to Advance Cell Efficiency

National Renewable Energy Laboratory	Golden	CO	$6,240,942	Project will research high-efficiency PV cells based on CIGS (copper indium gallium diselenide) in order to reduce related cost barriers. Areas of focus are to benchmark the project partners' PV devices, address the buffer and transparent conducting oxide layers, and broaden the approach to processing CIGS cells.	Foundational Program to Advance Cell Efficiency
National Renewable Energy Laboratory	Golden	CO	$3,500,000	Project will research high-efficiency concentrating PV cells based on high-efficiency materials; the goal is to approach the cells' photovoltage limit.	Foundational Program to Advance Cell Efficiency
National Renewable Energy Laboratory	Golden	CO	$1,500,000	Project will research high-efficiency cadmium-telluride PV cells on flexible glass with roll-to-roll processing.	Foundational Program to Advance Cell Efficiency
National Renewable Energy Laboratory	Golden	CO	$750,000	Project will develop a system for thin-film PV applications using Earth-abundant materials. Properties of the new PV cell will be tunable over a wide range to enable high-volume, low-cost manufacturing of PV modules.	Next Generation PV II
National Renewable Energy Laboratory	Golden	CO	$750,000	Project will develop technology that will allow amorphous silicon and organic materials-based PV technologies to break the Shockley-Queisser limit (i.e., a fundamental limiting factor to increasing solar cell efficiency), thereby dramatically improving solar conversion efficiency.	Next Generation PV II
National Renewable Energy Laboratory	Golden	CO	$750,000	Project will develop new copper-nitride PV cell layers based solely on Earth-abundant elements. Such elements are widely available and low in cost, providing excellent potential to reduce the cost of PV systems.	Next Generation PV II
National Renewable Energy Laboratory	Golden	CO	$750,000	Project will modify a copper-oxide base material through alloying with materials such as sulfur, zinc, and magnesium, thereby tailoring the band-structure properties to match the solar spectrum and leading to the development of a new PV cell layer material.	Next Generation PV II
Rocky Mountain Institute	Boulder	CO	$683,692	Project will accelerate large-scale adoption of solar PV through the creation and adoption of innovative approaches to utility regulation, rate design, and business models that enable high penetration of solar PV onto the utility grid.	Market Barriers and Non-Hardware Balance of System Costs
Colorado Total			**$17,908,998**		

University of Delaware	Newark	DE	$1,278,110	Project will develop new low-symmetry gratings for next-generation, thin crystalline silicon and CIGS (copper indium gallium diselenide) PV cells.	Next Generation PV II
University of Delaware	Newark	DE	$3,300,000	Project will research high-efficiency, silicon-based PV cells using thin-silicon wafers produced via high-speed laser processing. Increasing the speed of production, or throughput, will reduce the cost of the PV cell.	Foundational Program to Advance Cell Efficiency
University of Delaware	Newark	DE	$1,167,147	Project will research ultra-thin, CIGS PV cells based on a superstrate design. An improved superstrate (i.e., the layer on the sun-facing side of the cell) will allow the maximum transition of the sun's energy into the cell and increase its efficiency.	Foundational Program to Advance Cell Efficiency
University of Delaware	Newark	DE	$1,200,000	Project will advance processing technologies in CIGS PV. These advances will create improvements in manufacturing and increase solar cell efficiency.	Foundational Program to Advance Cell Efficiency
University of Delaware	Newark	DE	$960,000	Project will research the effects of sodium in CIGS PV cells.	Foundational Program to Advance Cell Efficiency
Delaware Total			**$7,905,257**		
University of South Florida	Tampa	FL	$987,717	Project will research the doping of thin-film, cadmium-telluride PV cells to increase cell open-circuit voltage, leading to higher cell efficiencies.	Foundational Program to Advance Cell Efficiency
FloridaTotal			**$987,717**		
Georgia Institute of Technology	Atlanta	GA	$1,500,000	Project will research high-efficiency PV cells based on thin wafer silicon.	Foundational Program to Advance Cell Efficiency
Georgia Tech	Atlanta	GA	$2,871,214	Project will develop reengineered, whole system designs to include module mounting, integration, materials, and wire management.	Extreme Balance of Systems Hardware Cost Reductions
GeorgiaTotal			**$4,371,214**		
Hawaii Department of Business, Economic Development and Tourism	Honolulu	HI	$750,000	Project will provide technical assistance to the state Public Utilities Commission as it sets statewide technical reliability standards through the form of a technical and policy-solution roadmap to resolve grid-reliability issues and to reduce commercial business concerns around the integration of renewables, specifically solar, onto the transmission and distribution systems.	Market Barriers and Non-Hardware Balance of System Costs

University of Hawaii	Honolulu	HI	$6,100,000	Project will develop and demonstrate utility-controlled, smart grid-enabled PV inverters at two utilities—one on the Island of Maui and the other, Oklahoma Gas and Electric, on the mainland. This technology has the potential to significantly reduce the system- and distribution-level impacts of distributed PV systems and facilitate their broader adoption at lower cost.	Solar Energy Grid Integration Systems: Advanced Concepts
Hawaii Total			**$6,850,000**		
Boise State University	Boise	ID	$2,820,154	Project will develop an open-source, project planning tool based on geographic information systems that optimizes siting for utility-scale solar developments. The tool will enable users to assess sites based on quantifiable physical characteristics and constraints of the natural resource as well as military, land use, solar resource, water resource, and public acceptance factors.	Market Barriers and Non-Hardware Balance of System Costs
Idaho Total			**$2,820,154**		
Illinois State University	Normal	IL	$850,000	Project will design, populate, and maintain a comprehensive national database of utility rates and rate design.	Market Barriers and Non-Hardware Balance of System Costs
University of Chicago	Chicago	IL	$1,500,000	Project will develop new nanocrystal-based materials for next-generation solar cells. The nanocrystals will be fabricated by very inexpensive and scalable wet chemistry, which will allow combining the advantages of conventional inorganic semiconductors with inexpensive fabrication.	Next Generation PV II
University of Illinois at Urbana-Champaign	Champaign	IL	$1,192,250	Project will develop new materials for contacts used in cadmium-telluride PV cells. Contacts are used on the front and back of solar cell to allow current to flow to an external circuit. The new materials will reduce the back-contact barrier to zero, increasing the current flow and thus the efficiency of the PV cell.	Foundational Program to Advance Cell Efficiency
Illinois Total			**$3,542,250**		
Delphi	Kokomo	IN	$1,900,000	Project will develop and demonstrate a PV inverter with a modular architecture designed to lower manufacturing costs and increase inverter reliability and serviceability.	Solar Energy Grid Integration Systems: Advanced Concepts
Purdue University	West Lafayette	IN	$750,000	Project will to develop inks based on copper, zinc, tin, and sulfur for deployment of low-cost PV cells.	Next Generation PV II
Indiana Total			**$2,650,000**		

Bandgap Engineering	Woburn	MA	$750,000	Project will develop silicon-nanowire arrays that will be used to create a new type of solar cell. The goal is to achieve a 36%-efficient solar cell using silicon only.	Next Generation PV II
Massachusetts Institute of Technology	Cambridge	MA	$1,500,000	Project will research next-generation, tin-sulfide materials via systematic defect engineering.	Next Generation PV II
Massachusetts Institute of Technology	Cambridge	MA	$750,000	Project will develop thin-film, crystalline-silicon solar cells with a thickness of less than 10 microns and efficiencies greater than 20%.	Next Generation PV II
SatCon	Boston	MA	$3,000,000	Project will develop and demonstrate a control architecture for PV inverters that virtually eliminates the impacts of voltage variation caused by PV generation variability.	Solar Energy Grid Integration Systems: Advanced Concepts
Massachusetts Total			**$6,000,000**		
Cascade Engineering	Grand Rapids	MI	$602,623	Project will develop an innovative racking system for commercial rooftops, using polymers.	Extreme Balance of Systems Hardware Cost
Raymond Tinnerman Manufacturing	Rochester Hills	MI	$1,670,000	Project will develop an innovative bracket system for commercial rooftop installations.	Extreme Balance of Systems Hardware Cost
The Dow Chemical Company	Midland	MI	$12,800,000	Project will develop a building-integrated PV application that includes high power density with an efficiency target as high as 30%, integrated schemes for heat management and recovery, and integrated power electronics.	Extreme Balance of Systems Hardware Cost Reductions
University of Michigan	Ann Arbor	MI	$1,500,000	Project will develop the next generation of organic PV technology using small-molecule systems incorporated into a tandem architecture.	Next Generation PV II
Michigan Total			**$16,572,623**		
University of Minnesota	Minneapolis	MN	$1,500,000	Project will develop tandem cells based on CIGS technology. The project addresses all three of the major barriers to tandem CIGS through the use of new materials and processes.	Next Generation PV II
Minnesota Total			**$1,500,000**		
North Carolina State University	Raleigh	NC	$1,000,000	Project will develop a multiple-junction PV cell capable of very high solar concentration (as high as 2,000 times the energy of sunlight falling on the cell). This research will advance concentrating PV technologies and lead to higher-efficiency solar panels.	Foundational Program to Advance Cell Efficiency
North Carolina Total			**$1,000,000**		

Princeton University	Princeton	NJ	$1,476,609	Project will develop organic molecules and polymers with appropriate parameters, deposit them onto silicon, characterize the fundamental properties of the interface, and then incorporate these silicon/organic interfaces into solar cells to create high efficiencies.	Next Generation PV II
New Jersey Total			**$1,476,609**		
GE Global Research	Niskayuna	NY	$1,575,985	Project will develop innovative components that simplify and reduce the cost of both the mechanical and electrical portions of the installation. Innovations include prewired, mechanically interconnected, foldable strings of PV modules.	Extreme Balance of Systems Hardware Cost Reductions
General Electric	Niskayuna	NY	$2,100,000	Project will demonstrate a cost-reduction approach for an alternating-current (AC) PV module that is driven by innovations in the microinverter design, module integration and packaging, and integration with a new intelligent circuit breaker.	Solar Energy Grid Integration Systems: Advanced Concepts
Interstate Renewable Energy Council	Albany	NY	$3,000,000	Project will focus on removing technical and administrative barriers to cost-effective interconnection and transmission, expanding market opportunities for solar PV by enabling the availability of net metering, community solar, and solar in wholesale power markets, and incorporating high-penetration PV scenarios into utility planning and operations management.	Market Barriers and Non-Hardware Balance of System Costs
New York Total			**$6,675,985**		
Ohio State University	Columbus	OH	$1,500,000	Project will advance the integration of high-efficiency semiconductor materials with silicon in a PV cell. The proposed approach provides a path to reduce the cost and increase the efficiency of concentrating PV cells.	Foundational Program to Advance Cell Efficiency
Ohio Total			**$1,500,000**		
Advanced Energy	Bend	OR	$3,100,000	Project will develop, demonstrate, and commercialize technologies designed to reduce the impacts of distributed PV systems and enable a high penetration of PV installations.	Solar Energy Grid Integration Systems: Advanced Concepts
Solar World Industries America	Hillsboro	OR	$4,636,633	Project will research the use of laser processing techniques to develop advanced device architectures leading to thin-silicon PV cells with higher efficiency.	Foundational Program to Advance Cell Efficiency
Oregon Total			**$7,736,633**		

Alencon	Plymouth Meeting	PA	$3,000,000	Project will develop, demonstrate, and commercialize a drastically cost-reduced, large-scale PV system. The planned system features a centralized, 100-megawatt inverter and a network that harvests high-voltage energy.	Solar Energy Grid Integration Systems: Advanced Concepts
Carlisle Construction Materials Incorporated	Carlisle	PA	$4,558,980	Project will develop low-cost, high-efficiency, flexible, building-integrated PV solar cells on roofing membranes.	Extreme Balance of Systems Hardware Cost Reductions
Pennsylvania Total			**$7,558,980**		
Electric Power Research Institute	Knoxville	TN	$4,400,000	Project will develop, implement, and demonstrate smart grid-ready PV inverters that include grid-support functionality and the utility communication and control link needed to capture the full value of distributed PV assets.	Solar Energy Grid Integration Systems: Advanced Concepts
Oak Ridge National Laboratory	Oak Ridge	TN	$1,500,000	Project will develop technologies that will overcome the open-circuit-voltage limitation in cadmium-telluride solar cells by understanding and controlling the grain boundaries (i.e., the bounding surface between crystals).	Foundational Program to Advance Cell Efficiency
Tennessee Total			**$5,900,000**		
Astro Watt	Austin	TX	$1,500,000	Project will research high-efficiency, thin silicon-based PV cells.	Foundational Program to Advance Cell Efficiency
SolarBridge	Austin	TX	$2,300,000	Project will develop an innovative AC-PV module that consists of an integrated “universal dock” and a high-reliability, low-cost, high-efficiency microinverter to substantially reduce balance of system costs in residential and commercial PV systems.	Solar Energy Grid Integration Systems: Advanced Concepts
University of Texas	Arlington	TX	$1,500,000	Project will develop new techniques for improving the surface of PV cells leading to efficiency increases. In addition, the team will investigate replacing the silver in PV cell contacts with aluminum to reduce costs.	Foundational Program to Advance Cell Efficiency
Texas Total			**$5,300,000**		
Old Dominion University	Norfolk	VA	$1,117,402	Project will research high-efficiency, ultra-thin, CIGS PV cells.	Foundational Program to Advance Cell Efficiency
Virginia Total			**$1,117,402**		

Solaflect Energy	Norwich	VT	$999,595	Project will further develop and refine the design of its Suspension Heliostat™—a design that uses 60% to 65% less steel than a traditional design, significantly reducing the cost of the mirror field in a concentrating solar power plant.	SunShot Incubator
Vermont Total			**$999,595**		
University of Washington	Seattle	WA	$492,865	Project will develop nanocrystal-based inks based on Earth-abundant elements for the production of low-cost PV systems.	Next Generation PV II
Washington Total			**$492,865**		
University of Wisconsin-Madison	Madison	WI	$462,508	Project will develop nanostructures of a pyrite semiconductor to overcome the material's bottlenecks and enable its application in high-performance solar PV devices. Pyrite is the most abundant sulfide mineral the Earth's crust.	Next Generation PV II
Wisconsin Total			**$462,508**		