

## Photovoltaics

The U.S. Department of Energy's (DOE's) Solar Energy Technologies Program (SETP) works with national labs, academia, and industry to develop cost-competitive solar energy systems. SETP's Photovoltaics (PV) subprogram aims to accelerate research and development (R&D) technology with the highest potential to reach cost competitiveness by 2015, invest in technologies with the capability of reaching long-term carbon reduction goals, and ensure a sustainable domestic PV manufacturing base. These efforts focus on making the cost of generating electricity using PV technology more comparable to, and competitive with, conventional utility-grid electricity prices—in other words, a “levelized” cost of electricity (LCOE).

To achieve this, the PV subprogram has structured its R&D funding to foster and accelerate efforts along the entire photovoltaic technology pipeline, including new devices and processes, prototype design and pilot production, and systems development and manufacturing. This effort begins by funding high-risk, technology proof-of-concept projects through the Next Generation PV Program. Discoveries made and demonstrated here then can be further developed into prototype designs through the PV Technology Incubator Program, and subsequently technologies can be further refined and advanced through Technology Pathway Partnerships, Supply Chain, and PV



Credit: NREL/PIX 14594

This 675-kW PV array graces the roof of the Moscone Center in downtown San Francisco, California, and covers 30,000 square feet of rooftop.

**Manufacturing Initiatives.** All of these approaches help lower the LCOE of PV technology.

The SETP's currently funding methods to advance all major PV cell technologies. These include wafer silicon (Si); amorphous and single-crystal, thin-film Si; high-efficiency (III-V) semiconductors; cadmium telluride (CdTe) and copper indium gallium diselenide (CIGS) thin films; and advanced organic and dye cells.

The national laboratories, start-up companies, universities, and integrated industry teams partner in these efforts. The ultimate goal is to achieve solar cost-competitiveness by 2015, which will lead to rapid and significant growth of PV electricity use in the United States.

### PV Program Portfolio

The SETP PV subprogram's funding opportunities cover a broad range of technology maturity.

**The Next Generation PV Program** seeds the beginning of the PV technology pipeline with high-risk / high-payoff projects and is meant to bridge the gap between basic and applied solar research. This program produces innovative, revolutionary, and highly disruptive PV approaches with the potential to dramatically change existing solar energy paradigms. These new PV technologies would be significantly less expensive than grid electricity and are intended to lead to prototype cells/processes by 2015 and achieve full commercialization in 2020-2030. A second installation of the Next Gen PV Program is anticipated to begin in 2011.

**The PV Technology Pre-Incubator Project** helps small solar businesses transition from concept verification of a solar PV technology to the development of a commercially viable PV prototype by 2012. The PV Technology Pre-Incubator targets the R&D advances

Credit: Amonix



The Amonix 7700 Solar Power Generator is an example of an SETP-funded solar energy project that received one of the R&D 100 Awards for 2010. For all R&D 100 Awards, visit <http://www1.eere.energy.gov/solar/accomplishments.html>.

needed to overcome barriers to creating an innovative and viable PV device or module prototype that is suitable for manufacturing scale up. Technology neutral, this project encompasses innovative PV cell and module technologies suitable for residential rooftop, commercial rooftop, and utility markets.

**The PV Technology Incubator Program** is currently in its fourth installment and seeks to foster innovation and growth in the domestic PV industry. It is structured to accelerate a diverse set of promising technologies which have been proven on a laboratory scale, and also represents a significant partnering with U.S. industry to meet aggressive cost goals. DOE funds the PV Incubator program through the National Renewable Energy Laboratory (NREL), and draws upon technical expertise from NREL and other national laboratories. The PV Incubator Program consists of two tiers. Tier 1 focuses on accelerating the development of innovative PV module-related technologies to the prototype stage. Tier 2 projects focus on shortening the timeline for companies

to transition innovative lab-scale and pre-commercial prototypes into pilot and eventually full-scale manufacture.

**The PV Supply Chain and Cross-Cutting Technologies** effort targets the reduction of manufacturing and product costs by improving common PV manufacturing processes and materials with the potential to impact the PV industry within two to six years. The second installment of this funding opportunity will continue to focus on improvements in PV components and the processes used to build them.

### Upcoming Programs for 2011

**The Technology Pathway Partnerships (TPP)** Program will evolve into a collaborative systems development program with a sharp focus on total system installed cost and LCOE by leveraging vertical integration up and down the complete systems supply chain.

**The Foundational Photovoltaics Program (FPV)** seeks to understand and overcome fundamental barriers to improved efficiency of commercial and near commercial semiconductors and to close the gaps between the performance of best laboratory cell efficiencies and theoretical maximum as well as best production efficiencies and laboratory results.

**The PV Manufacturing Initiative** seeks to support the creation of a robust U.S. PV manufacturing base and supply chain, develop a highly trained workforce with the required technical skills, and speed the implementation of new cutting-edge technologies. The initiative intends to accelerate the coordination of stakeholders and fund technology development across the U.S. PV industry. Lead organizations applied under two separate topics: University-Focused consortia that will solicit, select, and manage industry-relevant R&D projects related to PV manufacturing performed at universities and guided by industry, and Industry-Focused organizations that will accelerate the development and implementation of PV manufacturing-related technologies through collaborative research and/or by shared-use manufacturing development facilities.

### Solar Program Priorities

Photovoltaics is one of four subprograms in the DOE Solar Energy Technologies Program (SETP), along with Systems Integration, Concentrating Solar Power, and Market Acceleration. The SETP subprograms focus on accelerating the advancement of solar energy technologies to make solar electricity cost competitive with conventional forms of electricity by 2015. To learn more about SETP activities, visit [www.solar.energy.gov](http://www.solar.energy.gov).

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