

Solar America Initiative (SAI) PV Technology Incubator Program

Preprint

B. Keyes, M. Symko-Davies, R. Mitchell, H. Ullal,
B. von Roedern, and L. Greene
National Renewable Energy Laboratory

S. Stephens
U.S. Department of Energy

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THE SOLAR AMERICA INITIATIVE (SAI) PV TECHNOLOGY INCUBATOR PROGRAM

Brian Keyes, Martha Symko-Davies, Rick Mitchell, Harin Ullal, Bolko von Roedern, Lori Greene and Scott Stephens¹
National Renewable Energy Lab
1617 Cole Blvd., Golden, CO 80401
¹ U.S Department of Energy

INTRODUCTION

The Solar America Initiative (SAI) PV Technology Incubator Program, funded by the Department of Energy (DOE), through the National Renewable Energy Laboratory (NREL), has the objective of shortening the timeline for companies to transition prototype and pre-commercial PV modules into pilot and full-scale manufacture. Entrance opportunities for the Incubator project are anticipated every 9 – 12 months as funding become available. This program targets US small businesses with a minimum entrance criterion of a demonstrated PV cell process, lab device or module. The successful exit criterion is anticipated to be prototype modules and pilot production demonstration of approximately 3MW/year.

Ten U.S. Small Businesses received subcontracts from NREL in the fall of the calendar year 2007, averaging approximately \$3.0 million each of NREL/DOE funding over an 18-month period. The subcontracts were awarded in two 9-month phases with the second phase of funding contingent upon successful completion of the first phase deliverables and a Stage-Gate review. The award winners represent a diverse range of technologies including: polycrystalline thin-films; thin- and wafer-silicon devices; high-efficiency III-V devices; thin-film organics; and concentrating systems.

SAI PV INCUBATOR OVERVIEW

The SAI is an integral part of the President's Advanced Energy Initiative (AEI). The AEI is designed to reduce the nation's dependence on foreign sources of energy by promoting broader research and development (R&D) to achieve substantive breakthroughs in a variety of energy resources, including solar photovoltaic systems. The SAI, authorized under the Energy Policy Act of 2005, represents a significant enhancement of DOE's business strategy of partnering with U.S. industry to accelerate commercialization of photovoltaic (PV) system R&D to meet cost and installed capacity goals. These SAI goals are to 1) substantively accelerate development of U.S.-produced PV systems so that PV-produced electricity reaches parity with the cost of electricity in select grid-tied target markets across the nation and 2) expand the U.S.-installed domestic capacity of PV systems to 5-10 gigawatts (GW). The

Solar Energy Technology Program's (SETP) Posture Plan, http://www.eere.energy.gov/solar/solar_america/about.html, illustrates how the SETP aligns with the SAI mission and the President's Advanced Energy Initiative.

In order to accomplish the goals of the SAI, a multi-tiered, multi-phased program was established that addresses the near-, mid-, and long-term technological and scientific advances for improved performance, lower cost, and improved reliability of PV system components and installed systems.

The SAI PV Technology Incubator Program is designed to accelerate technologies/processes that have successfully demonstrated a proof-of-concept/process in a lab, but are not yet mature enough for large-scale commercial production. The emphasis is currently on the barriers to enter commercialization by 2010. Prototypes of these PV systems and components will be produced on a pilot-scale in a relevant operational environment with their demonstrated cost, reliability, or performance advantages. PV and CPV modules are targeted in this phase of the technology development pipeline with goals that include the more efficient use of materials, better performance, higher reliability and improved manufacturing. Details on the current solicitation requirements can be found at http://www1.eere.energy.gov/solar/solar_america/pv_incubator.html

EXISTING SUBCONTRACTS

Ten U.S. companies were awarded subcontracts through a competitive merit-review based process. The resulting projects include a diverse set of technological approaches: Inexpensive and Thin Film Si; Low and High Concentration; Innovative Thin Film Manufacturing; and Low Cost Multi-Junction Cell Production. The \$27M in DOE funds represents 29% of the \$93M worth of research and development taking place under the PV Incubator Program. The current subcontracted projects are listed below:

AVA Solar

AVA Solar has demonstrated fully automated, continuous in-line fabrication of CdS/CdTe PV. This project will enable the demonstration of extremely low manufacturing and equipment costs, improved module

efficiencies and the ability for rapid manufacturing capacity expansion.

Blue Square Energy

Manufacturing of thin crystalline silicon solar cell by growing a high purity silicon layer onto a low cost metallurgical grade silicon substrate. This approach can produce the high performance and reliability of traditional solar cells with reduced material utilization and manufacturing costs.

CaliSolar

Production of cost-effective solar cells from low-cost, abundant, but impurity-rich Si feedstock materials. The focus will be on a novel and adapted metallization method specifically suitable for the use of metallurgical Si to manufacture solar cells with over 17% efficiency using multicrystalline Si within the next 18 months.

EnFocus Engineering

A lightweight, low profile, high concentration PV module which is fully encapsulated and protected from wind, hail, dust and moisture. This module will utilize high efficiency multi-junction cells to generate higher power outputs in area-constrained applications such as rooftops.

MicroLink Devices

MicroLink Devices will develop a low-cost, high efficiency dual-junction GaAs-based solar cell for use in 500x concentrator systems. The developed solar cell minimizes GaAs material usage while improving heat dissipation with a potential to reduce cost by 50%.

Plextronics

Commercialization of Thin-Film Organic Photovoltaic (OPV) Technology. Plextronics will develop higher efficiency cells while increasing module lifetime design to enable this ultra low cost material to compete with traditional PV technology.

PrimeStar Solar

Develop commercial CdTe module production based on the NREL 16.5% world record CdTe laboratory solar cell technology. The increased module energy conversion efficiency will lower installation costs and open new markets for CdTe based thin film modules.

Solaria

Solaria's PV-multiplying process yields two to three highly efficient cells from one, via solar cell singulation and optical amplification. Solaria's DOE project aims to produce a non-tracking standard module form factor with 2-3X concentration manufactured in a reliable high volume automated process.

SolFocus

500x concentrating PV module emphasizing high reliability and high efficiency to enable large-scale commercial and utility market penetration. A folded reflective design allows for a high optical efficiency and acceptance angle in a compact frame.

SoloPower

Development of an electroplating-based, high-efficiency, low-cost CIGS cell and module manufacturing technology. Advantages of this deposition technique include lower equipment costs, reduced processing times and increased material utilization.

Detailed results from the funded activities will be made available in the publicly released Final Technical Reports.

CURRENT AND FUTURE SOLICITATIONS

The current PV Incubator subcontracts will undergo a Stage-Gate review during the summer of 2008. At this time an evaluation of progress will occur and a determination to continue with the second 9 month phase of the subcontract will be made.

A second PV Incubator Solicitation occurred in early 2008 and those responses are currently being reviewed. It is anticipated that the new round of subcontracts will be finalized in late summer of 2008.

Finally, as mentioned above, future entrance opportunities for the Incubator project are anticipated every 9 – 12 months as funding opportunities become available. This would put the next solicitation in early 2009.

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