2008 Solar Annual Review Meeting

Session: Organic Photovoltaics, Sensitized Cells and Seed Funds
Company or Organization: Plextronics, Inc.
Funding Opportunity: PV Incubator

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PLEXTRONICS
Light. Power. Circuitry.™

Budget and Solar America Initiative Alignment

Plextronics, Inc.					
Project Beginning Date	**Project End Date**	**FY07 Budget**	**FY08 Budget**	**FY09 Budget**	**Total Budget**
Sept. 28th 2007	Mar 28th 2009	$ 675,000	$ 2,500,000	$ 575,000	$ 3,750,000
	Cost share	$ (135,000)	$ (500,000)	$ (115,000)	$ (750,000)
	SAI funded	$ 540,000	$ 2,000,000	$ 460,000	$ 3,000,000

This project supports the Solar America Initiative by:

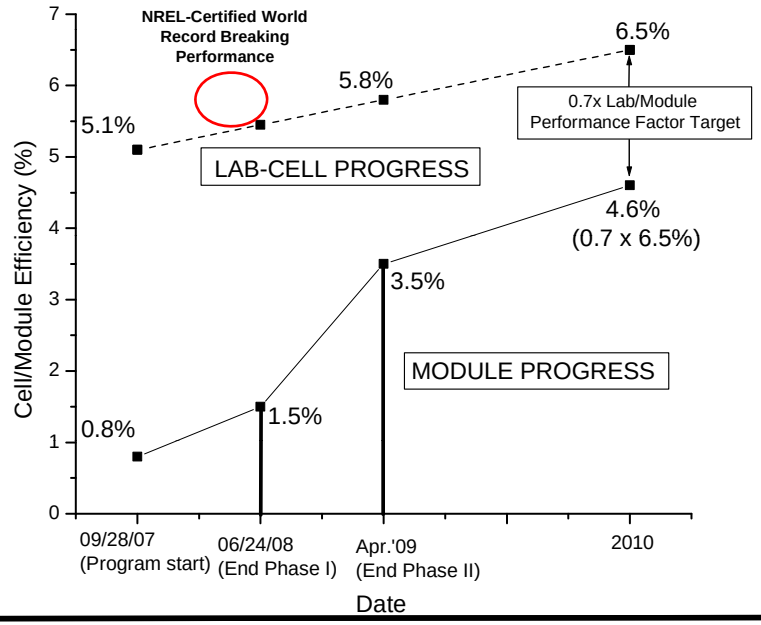
1. Driving Commercialization of Novel Low-Cost Thin Film PV Technology *via* development of commercial high performance OPV inks.

2. Developing Modeling Capabilities that allow for systematic, quantitative evaluation of technological options on the pathway toward achieving grid parity with conventional sources of power.

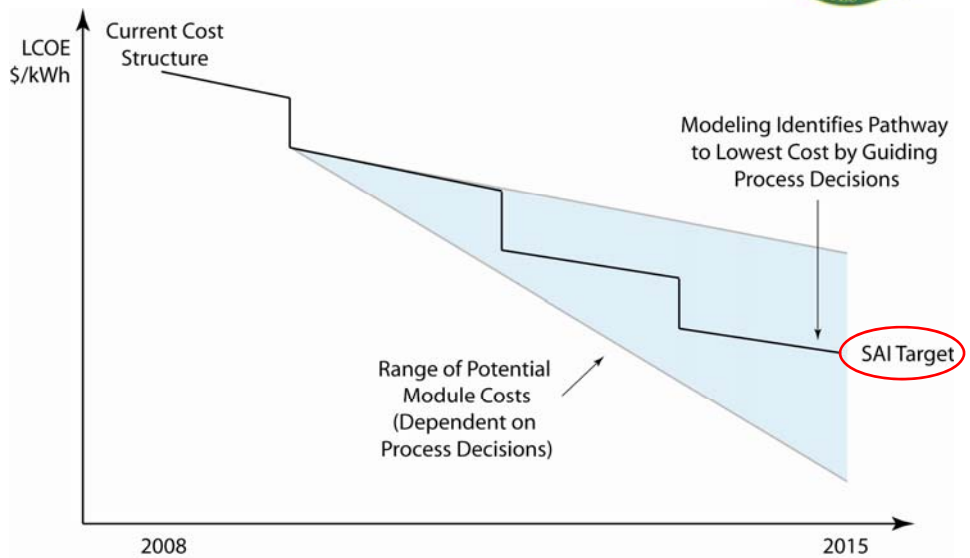
3. Demonstrating a Large Area OPV Module Pilot Line and utilizing it as a pathway towards establishing high volume manufacturing facility to contribute towards U.S. installed domestic capacity for PV systems.

Project Overview

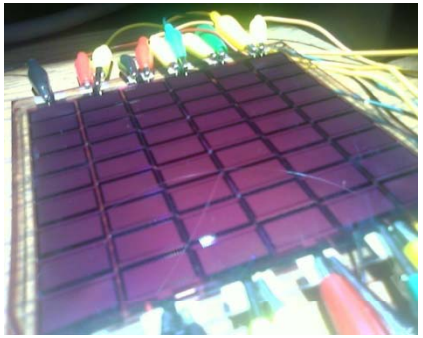
1. World-Class Materials Performance



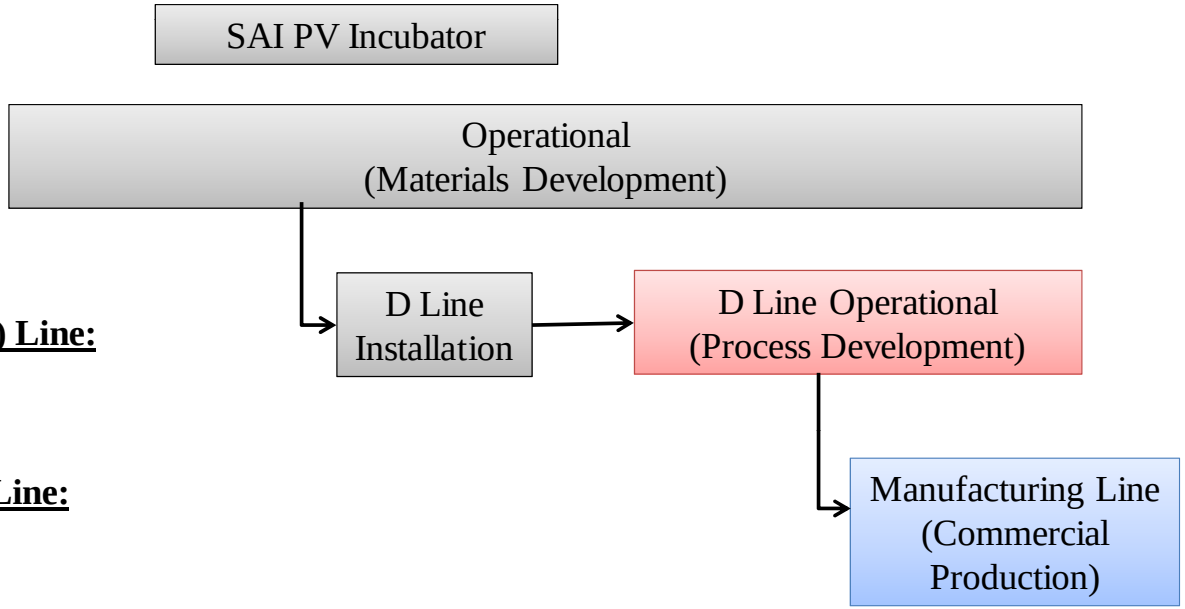
2. Analytical Model To Define Pathway To Grid-Parity



3. Roadmap To High-Volume Manufacturing



15 cm x 15 cm Module
1.7 % (total area) efficiency



Project Alignment with Technology Roadmap

Need	Significance	Plextronics' Approach To Address Roadmap Needs
Fundamental understanding/device physics—excitons, charge transport, recombination, band structure, and interfaces.	Place constraints on what fundamental properties are required and what performance goals may be achieved.	• Design of unique p and n type materials. • Transient spectroscopy techniques to identify key species involved in OPV operation. • Refine materials based on model with continuous input of active layer and device operational observations.
Discovery of new donor and acceptor materials with optimized light absorption, band structure, and transport properties.	Develop/identify molecules and materials that implement the fundamental concepts to enable high efficiency.	• Synthesis of novel materials to meet high efficiency goals • Iterate *via* OPV device operation and p/n blend material data.
Control of donor-acceptor morphology and new ideas for active-layer geometry.	Find optimized morphologies in which to arrange the donor and acceptor materials.	• Utilize formulation expertiese to develop active layer inks • Infer best designs and refine *via* monitoring of effective active layer morphologies.
Optimization of complete device architecture, including active layer, buffer layers, and electrode and transparent conducting oxide materials.	Develop a complete device geometry that harnesses the power captured in the active layer.	• Device design iterations and fabrication to yield high performance OPV cells and modules.
High-throughput fabrication techniques for scale-up to larger-area devices and atmospheric processing.	Develop large-area, high-speed fabrication techniques that retain the efficiency of laboratory-scale cells.	• Establish a pilot-line to investigate process development • Translation of laboratory performance into commercial scale manufacturing.
Studies of reliability and long-term degradation mechanisms.	Identify degradation pathways and use to improve molecule and device design.	• Currently being studied as a part of CRADA with NREL with a focus on intrinsic and extrinsic causes of device instability.

Project Update

	Planned Work	Status
Past	Report Summarizing Baseline Lab-Cell and Module Performance	Delivered Oct. '07
	Report on Lab-Cell Performance	Delivered Oct. '07
	Report on LCOE Model	Delivered Oct. '07
	Deliver a Lab-Cell Sample (NREL-tested)	Delivered Oct. '07
	Quarterly Report	Delivered Dec. '07
	Report on Design and Fabrication of Stage 1 Pre-Production Prototype Module	Delivered Dec. '07
	Report and Update on LCOE Model	Delivered Mar. '08
	Quarterly Report	Delivered Mar. '08
	Report on the Design of Pilot-Scale OPV Module Fabrication Line	Delivered Apr. '08
Future	Report on Lab-Cell Performance	Jun. '08
	Report and Update on LCOE Model	Jun. '08
	Deliver a Prototype Stage 1 Gen 1Pre-Production Module	Jun. '08
	Stage Gate Review and Progress Report	Jun. '08
	Report and Update on Pilot-Scale OPV Module Fabrication Line	Aug. '08
	Report on Design and Fabrication of Stage 2 Pre-Production Prototype Module	Sept. '08
	Report and Update on LCOE Model	Sept. '08
	Quarterly Report	Sept. '08
	Report and Update on LCOE Model	Dec. '08
	Quarterly Report	Dec. '08
	Deliver a Lab-Cell Sample (NREL-tested)	Jan. '09
	Assemble a Gen 2 module for NREL testing	Mar. '09
	Deliver a Prototype Stage 2 Gen 1 Pre-Production Module	Mar. '09
	Final Review	Mar. '09

Obstacle Discussion

- Major Technical Barriers for Commercial Viability of Modules
  - Commercial Encapsulation
  - High Throughput Electrode Deposition

- Plextronics has identified pathway for addressing these technical challenges and are on track for intersecting with DOE's goals of grid parity with conventional power sources by 2015.
- Plextronics has also modeled their business plan to accelerate commercial goals for OPV modules as per DOE roadmap.