
2008 Solar Annual Review Meeting

Session: CPV

Company or Organization: Amonix, Inc.

Funding Opportunity: Technology Pathway Partnership



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Budget and Solar America Initiative Alignment



<i>Amonix, Inc.</i>			
Project Beginning Date	FY07 Budget	FY08 Budget	Total Budget
5/14/07	\$3.2 million	\$5.8 million	\$15.6 million

- This project supports the Solar America Initiative to achieve its accelerated 2015 cost targets for utility markets through:
 - Development of a high-volume (25 MW/yr), low-cost manufacturing facility in three years.
 - Redesign of components of its high concentration PV system for high-volume, low-cost manufacture and installation.
 - Reliability testing of redesigned system components.
 - Incorporation of multijunction solar cells into its redesigned system.

Market Sector	Current U.S. Market Price Range (¢/kWh)	Cost (¢/kWh) Benchmark 2005	Cost (¢/kWh) Target 2010	Cost (¢/kWh) Target 2015
Residential	5.8-16.7	23-32	13-18	8-10
Commercial	5.4-15.0	16-22	9-12	6-8
Utility	4.0-7.6	13-22	10-15	5-7

Project Overview



10 MW Guascor-Foton Power Plant

- Principal objective of the project is to transition Amonix CPV systems from low-volume to high-volume (25 MW/yr) production
 - Joint venture partnership with Guascor-Foton in Spain has provided valuable information through their deployment of almost 15 MW of Amonix CPV technology.



A long-term objective is to evaluate and incorporate multijunction solar cells into Amonix CPV systems.

Long-term testing at University of Nevada, Las Vegas under an NREL subcontract will guide design of multijunction cell packaging.



Project Alignment with Technology Roadmap



Need	Significance	Approach
Establish reliability of prototypes	Needed for market entry. Address at all levels, from detailed understanding of failure mechanisms through field testing of systems.	Addressed through use of selected stress tests in IEC 62108 and field testing of selected material and design changes in established, fifth-generation Amonix CPV system.
Optimize design of overall system	Many opportunities for cost reduction; system-level approach needed.	Approach involves redesign for reduced module depth and mass, low-cost, high-volume automated manufacturing as well as high-volume, low-cost installation.
Reduce system cost	Address cell, optics, and tracker; cell cost reduction alone could reduce system cost by 10% to 15%.	Addressed through reduction of materials, automated manufacturing, lower installation costs and identification of high-volume vendors.
Increase system efficiency	Reduce system losses from optics; increasing cell efficiency from 35% to 39% could reduce \$/kWh by 10%.	Dramatic system efficiency increase targeted through transition from silicon to multijunction solar cells when system reliability is established.

Project Alignment with Technology Roadmap



Need	Significance	Approach
Develop industry product and rating standards	Market entry	Amonix has supported development of CPV standards for over 10 years.
Develop more-efficient and more-forgiving optical systems	Improve efficiency; simplify manufacturing; ease operation and maintenance.	Improve secondary lens, develop fast-cure lens adhesive and partner with lens supplier to develop new lens design while maintaining lens efficiency and reliability.
Understand system performance as a function of solar resource	Specify performance of system to customers for market entry.	Long-term field testing in Nevada to establish correlation between solar resource and kWh/kW.
Develop concentrator-specific inverters.	Improve handling of maximum power-point tracking (MPPT) and start-up/shut-down for big power fluctuations from array.	Partnership with inverter supplier targets these and related issues.

Project Update



Planned Work since last Program Review	Status-Work began in May 2007
Task 1: MegaModule Component Design Update	Past and future (on-schedule) effort in months 1-20
Task 2: Research & Development of New Materials & Processes	Past and future (on-schedule) effort in months 1-35
Task 3: Pilot Factory Automation Line	Past and future (on-schedule) effort in months 1-19
Task 4: High Production Automation	Future (on-schedule) effort in months 19-35
Task 5: UNLV 16 inch MegaModule Testing	Past and future (on-schedule) effort in months 1-13
Task 6: 16 inch MegaModule Design Update	Past and future (on-schedule) effort in months 9-16
Task 7: Plant & Equipment Design	Past and future (on-schedule) effort in months 1-18
Task 8: Pilot Factory Setup	Future (behind-schedule) effort in months 11-20

Project Update



Planned Work since last Program Review	Status - Work began in May, 2007
Task 9: Production Factory Setup	Future (on-schedule) effort in months 20-36
Task 10: Fabrication of MegaModules: Fabricate 24 Si MegaModules	Future (on-schedule) effort in months 21-23
Task 11: Design Update of Drive & Tracking Control	Past (on-schedule) effort in months 4-11
Task 12: Testing of the 7 MegaModule Drive & Tracking Controls	Future (on-schedule) effort in months 11-23
Task 13: Advanced Drive and Tracking Control Development	Future (on-schedule) effort in months 11-23
Task 14: Design of Balance of System (BOS)	Past and future (on-schedule) effort in months 4-13 and 26-29
Task 15: Bench Testing Balance of System (BOS) Components	Past and future (on-schedule) effort in months 9-12
Task 16: Design Field Installation Process and Equipment	Past and future (on-schedule) effort in months 4-10 and 24-32

Project Update



Planned Work since last Program Review	Status - Work began in May 2007
Task 17: Testing of Field Installation Equipment	Future (on-schedule) effort in months 10-33
Task 18: Si Field Installation of the 5 and 7 MegaModule Units and Testing	Future (on-schedule) effort in months 19-36
Task 19: System Testing	Future (on-schedule) effort in months 22-36
Task 20: MJ Performance & Reliability Testing of Single Plate MJ Amonix Module	Past and future (on-schedule) effort in months 1-36
Task 21: Multijunction Cell Incorporation	Past and future (on-schedule) effort months 1-36
Task 22: MJ Fresnel Design Update	Past and future (on-schedule) effort in months 9-21
Task 23: Design and Fabricate MJ Pilot Production Tooling	Future (on-schedule) effort in months 19-32
Task 24: Procurement of Multijunction Cells from Vendor	Future (on-schedule) effort in months 21-33

Obstacle Discussion



- Obstacles include the following technical, market and competitive challenges:
 - Assuring reliable and cost-effective deployment of Amonix CPV technology incorporating multijunction cells and many other CPV system components redesigned for high-volume, low-cost manufacturing
 - Inadequate federal, state and local market and financial incentives and policies for project and company investors
 - Inadequate support for standards organizations to develop an array of CPV standards and certifications needed for success in the marketplace
 - Project failures caused by premature deployment of CPV systems by companies with new or redesigned technologies
 - Entry into U.S. markets by overseas companies bringing technologies matured through their deployment in favorable overseas markets
 - Successes in the competitive landscape that include dozens of new CPV companies, thin film PV companies, expanding crystalline silicon PV giants, concentrating solar power companies, other renewable energy companies as well as improvements in conventional electric utility generation technologies
 - Temptation for technology theft due to huge potential profits in the world's exploding desire for carbon-free electricity