

Cost Of Photovoltaic Concentrators Falling Fast

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Solar concentrators using highly efficient photovoltaic solar cells will reduce the cost of electricity from sunlight to competitive levels soon, attendees were told at a recent international conference on the subject.

Herb Hayden of Arizona Public Service (APS) and Robert McConnell and Martha Symko-Davies of the U.S. Department of Energy's National Renewable Energy Laboratory (NREL) organized the conference held May 1-5 in Scottsdale, Ariz.

"Concentrating solar electric power is on the cusp of delivering on its promise of low-cost, reliable, solar-generated electricity at a cost that is competitive with mainstream electric generation systems," said Vahan Garboushian, president of Amonix, Inc. of Torrance, Calif. "With the advent of multijunction solar cells, PV concentrator power generation at \$3 per watt is imminent in the coming few years," he added.

We have seen steady progress in photovoltaic concentrator technology. We are working with advanced multijunction PV cells that are approaching 38% efficiency, and even higher is possible over time. Our goal is to install PV concentrator systems at \$3 per watt, which can happen soon at production rates of 10 megawatts per year. Once that happens, higher volumes are readily achieved," Hayden, Solar Program Coordinator at APS, said.

Growth in the photovoltaic (PV) concentrator business was reflected in the conference attendance, three times that of the 2003 version. This

rapid growth was attributed to recent PV concentrator installations and sales forecasts along with excitement created by new solar cell efficiencies approaching 40%.

At the conference, NREL announced a new record efficiency of 37.9 percent at 10 suns, a measure of concentrated sunlight. Soon thereafter Boeing-Spectrolab, under contract to NREL and the Department of Energy, surpassed the NREL record with 39.0 percent at 236 suns announced at the European photovoltaic conference in Barcelona, Spain. The efficiency of a solar cell is the percentage of the sun's energy the device converts to electricity.

Photovoltaic (PV) concentrator units are much different than the flat photovoltaic modules sold around the world; almost 1,200 megawatts of flat PV modules were sold last year. PV concentrators come in larger module sizes, typically 20 kilowatts to 35 kilowatts each, they track the sun during the day and they are more suitable for large utility installations.

Another highlight of the conference was the announcement by Amonix Inc. of a joint venture with Spain's Guascor which will build a 10-megawatt per year assembly plant in Spain by the end of 2005. Amonix also plans to install 3 megawatts of PV concentrator systems in the southwestern U.S. while Guascor plans to install 10 megawatts of concentrator PV systems in Spain in 2006.

Solar Systems of Australia announced plans to install more than 5 megawatts of PV concentrator systems in 2006. "Solar Systems' experience gained from installing and operating reliable PV concentrator systems over the last decade combined with its strong relationship with Spectrolab Inc., a leading manufacturer of multijunction solar cells, is poised to make a major step towards being a mainstream power producer," said Dave Holland, CEO of Solar Systems Australia.

"The new solar cell technology from Spectrolab will enable us to upgrade our systems from 24 kilowatts to 35 kilowatts, a 46 percent increase in output," he added.

The ultra-high efficiency solar cell technology, initially discovered at NREL and successfully developed for space satellites in the 1990s by Boeing-Spectrolab Inc., in Sylmar, Calif., proves to be enabling for low-cost terrestrial SEC systems.

"Today, we are capitalizing on the major investments made by the space satellite industry and reducing the cost of the semiconductor solar cell by two to three orders of magnitude by operating the cells under high sun concentrations, typically 300 to 1000 times.

"Boeing-Spectrolab and NREL have demonstrated over 37 percent efficient concentrator solar cells and field testing of Spectrolab's cells for over one year with no degradation promise a bright future.

"We expect concentrator solar cell performance to reach or exceed 40 percent by 2006 and anticipate continued enhancement in performance and reliability," said Dr. Nasser Karam, vice president of Advanced Technology Products at Spectrolab Inc.

"We are working closely with PV concentrator manufacturers to ensure their success and expedient deployment of the multijunction PV concentrator cells" said Dr. Raed Sherif, director of PV concentrator products, at Spectrolab.

The U.S. Department of Energy, through NREL and its High Performance Photovoltaic Project, funds many of the U.S. research efforts reported at the conference.

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