Solar CPV Electrical Power and Water Purification Systems

Saturday December 3, 2011, 10:00 AM – 5:00 PM
Southwest Solar Technologies, 3545 S. 28th Street, Phoenix, Arizona 85040

Co-chairs
Russ Genet, California Polytechnic State University, russmgenet@aol.com, 805 438 3305
Herb Hayden, Southwest Solar Technologies, herbhayden@swsolartech.com, 480 425 2615

Workshop Agenda

10:00 - 11:00 **Introductions and overviews**

Welcome	Herb Hayden, Southwest Solar Technologies
Attendee self introductions	All
Workshop Introduction	Russ Genet, California Polytechnic State University
Large CPV/clean water systems	Herb Hayden, Southwest Solar Technologies

11:00 - 11:30 Break and Tour of Southwest Solar Technologies

11:30 - 12:30 **CPV solar power**

Strawman mobile 2.4 meter system	Dwight Collins, Collins Educational Foundation
A medium concentration CPV solar system	Alan Kost, University of Arizona
Evaluation of HCPV systems	V. Lonij/A. Brooks, University of Arizona

12:30 - 1:30 Group photograph in front of the 22 meter dish
On-site lunch provided by the workshop sponsors: Southwest Solar Technologies, Mobile Solar Initiative, Collins Educational Foundation, and Blue Bottle Vending

1:30- 3:30 **Water purification**

Solar driven water purification	Wendell Ela, University of Arizona
Solar energy/water treatment scenarios for AZ	Ardeth Barnhart, University of Arizona
Evaluation of membrane distillation technology*	Kamalesh Sirkar, NJ Institute of Technology
Epiphany solar clean water systems	Tom Joseph/Henry Wandrie

3:30-4:00 Break

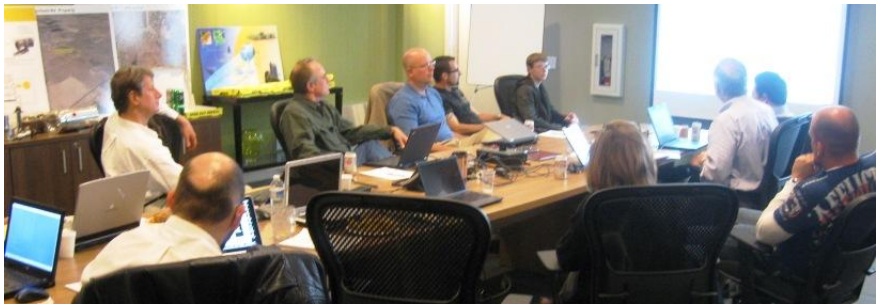
4:00 - 5:30 **Astro-solar commonalities and low cost mirror technologies**

Cherenkov radiation telescopes	Dave Kieda, University of Utah
Stellar Intensity Interferometers	Dave Kieda, University of Utah
SCOTS test for solar & telescope mirrors	Peng Su, University of Arizona

Workshop attendees (left to right): Dwight Collins, Paul Thomas, Dave Kieda, Russ Genet, Herb Hayden, Alan Kost, Ardeth Barnhart, Dave Genet, Wendell Ela, Tim Wiese, Peng Su, and Colby Parker. The photo was taken by Russ Genet (Jr.), who also attended the workshop.

The Mobile Solar Initiative's second workshop took place in Phoenix, just south of Sky Harbor Airport at the headquarters for Southwest Solar Technologies facility. A dozen folks attended the workshop. This workshop gave more emphasis to the "stellar-solar connection" than the San Francisco workshop, although the majority of the talks and discussion were about concentrated photovoltaic solar power systems and solar water purification.

Conference attendees stand at the base of Southwest Solar Technologies' 22 meter, multiple mirror panel parabolic reflector. The reflector is pointed toward the ground and the square white screen on the boom just above the group was installed at the focal point for astronomical observations that night. Sadly, it remained cloudy so we were unable to make the observations, although we enjoyed our extended dinner☺.



Top photo far side of table from the left: Alan Kost, Herb Hayden, Dave Genet, Tim Wiese, and Colby Parker. Bottom photo far side of table from the left: Peng Su, Dwight Collins, Russ Genet (Jr.), Ardeth Barnhart, and Dave Kieda. Russ (Sr.) took the pictures.

A much discussed topic at the workshop was membrane water distillation. Ardeth Barnhart (University of Arizona) gave an overview of a solar water distillation system in northern Arizona on the Navajo Nation which has many off-grid locations and sits on a brackish water table. This system uses hot water (not quite boiling) and a rolled up membrane (that is also used in the orange juice industry) for the distillation.

During a break period, we toured the shop facilities at Southwest Solar Technologies. Paul Thomas points to control electronics, while Alan Kost and Peng Su listen in. Dwight Collins contemplates the utility of the grid pattern on the iron table.

Ardeth and Dwight Collins (Presidio Graduate School) discuss the solar/membrane water distillation system at the Navajo Nation in northern Arizona. While the orange juice membranes work okay, much higher efficiency membranes are being tested at the New Jersey Institute of Technology by Kamalesh Sikar, who gave a call-in briefing on these units manufactured by Advanced Membrane Technologies.

Wendell Ela, University of Arizona (on the right), gave an overview of various ways that water can be purified, with emphasis on a number of distillation approaches, including membrane distillation. During the discussions, Dave Genet and Russ Genet (Jr.) described their firm, Blue Bottle Vending, which makes reverse osmosis water purification units.

. Dave Kieda, University of Utah, Chair of the Physics Department (on the left above), gave two astronomy talks, one on Cherenkov radiation telescopes and the other on stellar intensity interferometers. These two specialty areas within astronomy use large, low cost light collectors that are similar in many respects to the large (22 meter) concentrated solar power dish made by Herb Hayden *et al* at Southwest Solar Technologies. Dave wanted to know if Herb could make similar 22 meter dishes with tighter optical specifications. Herb thought this could be done. Herb also suggested that a "small" dish with just a single row of panels might be useful as an 8 meter light bucket telescope.

Solar intensity interferometry, an area originally pioneered by Hanbury Brown in Australia, is being revived by Dave and his colleagues at the University of Utah and is an area of keen interest to Russ (Sr.) and Bruce Holenstein (unable to attend). Back in the 1960's and early 1970's Hanbury Brown placed two 6.5 meter multiple mirror telescopes on a circular track 180 meters in diameter. These mobile telescopes, which were controlled by analog electronics, used photomultipliers as the detectors and analog electronics for signal correlation. They measured the quantum de-correlation of light versus telescope spacing. They provided the first direct measurements of the diameters of 32 nearby stars. Modern telescopes, very high speed solid-state detectors, and fast parallel digital correlators should allow multiple "light bucket" telescopes to provide images of the surfaces of nearby stars, as well as images of close and contact binary and multiple star systems.

Hanbury-Brown's two famous "portable" light bucket telescopes in Narrabri, Australia, (above) exemplify the on-axis photon hunger of some dedicated science telescopes. Another area that requires an abundance of low cost photons is Cherenkov radiation telescopes. When gamma rays, emitted by highly energetic events in the cosmos, hit the top of the earth's atmosphere, they create a shower of particles that, as they descend through the atmosphere, emit faint, blue, Cherenkov radiation. This radiation can be detected by an array of light bucket telescopes, such as the VERITAS pictured below at the base camp at Mt. Hopkins in southern Arizona where Dave Kieda and colleagues gather scientific data.