

Technical Report from the 1st Southeast Solar Summit

Oak Ridge National Laboratory
October 24-25, 2007



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Southeast Solar Summit - October 24-25, 2007

EXECUTIVE SUMMARY

The 1st Southeast Solar Summit was held at Oak Ridge National Laboratory's (ORNL) Conference Center on October 24-25, 2007. Over 200 individuals participated in the Summit, including many leading researchers, scientists, architects, and other renewable energy professionals. Participants were primarily from the Southeast but included professionals from as far away as Washington State. The Summit aimed to promote solar research and development (R&D) and market transformation in the region. The event also facilitated strategic partnerships of established regional organizations that understood the energy needs, economics, and market of our demographic.



Fig. ES-1. New Solar Array at ORNL

The Summit, co-hosted by ORNL and the Southern Alliance for Clean Energy (SACE), consisted of two primary tracks, three keynote addresses, several plenary sessions, and numerous facilitated discussions. The first track, chaired by Curt Maxey, ORNL, focused on all aspects of solar-related R&D occurring within the region, including general photovoltaics (PVs), concentrated photovoltaics (CPVs), building-integrated photovoltaics (BIPVs), and the direct use of sunlight for lighting and other applications. The second track, chaired by Gil Melear-Hough, SACE, covered opportunities for market transformation within the Southeast with topics ranging from state and Federal incentives to the role of utilities.

An outline of a Southeast regional plan for solar and renewable energy market transformation was initiated during a brainstorming session facilitated by Scott Hennessey, Solar Energy Industries Association (SEIA) Manager of Policy and Research. The session emphasized that market transformation is achievable at all levels (e.g., home, community, state, and Federal), and Summit speakers repeatedly urged attendees to take action by calling their elected officials and expressing interest in their increased participation and support of renewable energy. Several strengths and opportunities were identified, including a wealth of research facilities across universities and a national laboratory for continued advanced R&D, participation in Green Power programs, and promotion of renewable energy companies to the region. The Southeast has gotten a relatively late start within this industry, but many benchmarks are available nationwide to help catapult the region among solar and renewable energy leaders. The regional needs and associated action items were identified by participants as:

- An educational campaign on the capabilities of solar technologies;
- An expanded skilled workforce that can install solar technologies;
- A regional solar champion;
- A two-front approach (state + federal) to provide incentives for purchasing solar technologies;

- More “zero energy” homes/communities;
- Additional marketing of solar technologies;
- More solar companies within the region; and
- New solar research, development, demonstration and deployment (RDD&D) partnerships.

Other Summit highlights included:

- A dedication ceremony for a new single-axis tracking photovoltaic array recently installed in front of the ORNL Visitors Center capable of providing 9000 kWh per year;
- Twelve exhibits (see Appendix B) from the Southeast region, Colorado, and Canada;
- Optional tours of the Near-Zero Energy homes in Lenoir City, the 29 megawatt Buffalo Mountain Wind Farm near Oliver Springs, the Spallation Neutron Source atop Chestnut Ridge, and the new Center for Advanced Thin Film Solar Cells (CATS) facility, and the Hybrid Solar Lighting system in the ORNL Solar Laboratory;
- Optional seminars on October 26, covering two alternative uses of solar energy:
 - Hybrid Solar Lighting;
 - Roof-mounted Solar Space Heating.

A complete list of Summit participants, sponsors, and exhibitors as well as the final program and all presentations are available online at www.ornl.gov/solarsummit.

INTRODUCTION

Solar energy was the spotlight as researchers, engineers, architects, lighting designers, and other renewable energy experts from the region convened at Oak Ridge National Laboratory (ORNL) on October 24-25 for the 1st Southeast Solar Summit. Sponsors of the event included ORNL, the U.S. Department of Energy (DOE), the Tennessee Valley Authority (TVA), Solar Energy Industries Association (SEIA), and the Southern Alliance for Clean Energy (SACE). Other participants included Lakeland Electric, Georgia Institute of Technology, Solar Electric Power Association, LightWave Solar Electric, Sterling Planet, Sunlight Direct LLC, North Carolina Solar Center, and the Florida Solar Energy Center. The purpose of the Summit was to focus on new opportunities to promote solar research and development (R&D) and market transformation within the Southeast. The 1st Southeast Solar Summit served to facilitate strategic partnerships with established regional organizations that understand the energy needs, economics, and market of our demographic.



Fig. 1: Opening morning of 1st Southeast Solar Summit

Among the displays was an Arizona Public Services photovoltaic solar array that will be providing about 9000 kWh of electricity over the course of the year to offset ORNL's energy usage. The array uses Sharp Electronics photovoltaic modules manufactured in Memphis, TN. A concentrator photovoltaic (CPV) system from JX Crystals was also on display.

While the desert Southwest is often associated with an abundance of sunshine and potential solar energy, the use of solar energy is increasing worldwide. In fact, Germany is presently the fastest growing market for solar photovoltaic modules, annually adding significantly more PV generating capacity to its electric grid than any other country. In the Southeast, the average amount of sunlight available for producing electricity is twice that available in Germany. Within a few hundred miles of the ORNL, some of the nation's best and brightest in the area of solar energy and photovoltaics reside. In fact, over 35 PV manufacturers and research and development companies have operations east of the Mississippi River. Similarly, nine universities east of the Mississippi River are conducting PV-related research. The Summit brought these people and their organizations together to focus on new opportunities to promote collaborative solar R&D and market transformation in the Southeast.

Attendees included energy managers, policy advocates, industry executives, utilities, the public sector, educators, researchers, economic development specialists, community action agencies, builders, legislators, students and community planners.

Participants were given the opportunity to tour either the Near-Zero Energy Homes in Lenoir City, the Buffalo Mountain Wind Farm near Oliver Springs, or the Spallation Neutron Source (Fig. 2). The Near-Zero Energy Habitat for Humanity homes boast electric bills as low as 41¢ per day, while the wind farm features 15 1.8-megawatt turbines atop Windrock. John Morris,

President and CEO, Sunight Direct lead a workshop on Hybrid Solar Lighting was also offered the day after the Summit.



Fig. 2. (Left to right) A Near-Zero Home at the Habitat for Humanity subdivision in Lenoir City, TN; Buffalo Mountain Wind Farm in Oliver Springs, TN; Spallation Neutron Source in Oak Ridge, TN

Other activities included the unveiling of ORNL's Center for Advanced Thin Film Solar Cells, a new user center consisting of four adjacent laboratories that will focus on photovoltaics (PV) R&D and will include a variety of diagnostic capabilities. Solid-state lighting research will also be conducted in this facility, dubbed CATS.

Opening Remarks

Dr. Dana Christensen, Associate Laboratory Director for the Energy and Engineering Science Directorate, welcomed the participants to the 1st Southeastern Solar Summit on behalf of the ORNL, <http://www.ornl.gov/solarsummit/presentations/ornlwelcome.pdf>. Ryan Gooch, Director of Energy Policy for the Tennessee Department of Economic & Community Development (ECD), followed with welcoming remarks on behalf of the state of Tennessee. The mission of Tennessee's ECD Energy Division is to promote sound economic development policies and programs both to retain existing business and industry and foster new investment and job creation throughout the state. Through grants from the U.S. Department of Energy (DOE), the Energy Division provides a broad range of energy efficiency programs to business and industry, state and local governments, schools, and residential consumers. All programs focus on energy efficiency measures and promote energy cost and dollar savings. These technical and financial assistance programs and services have helped implement projects that reduce energy bills, improve facilities, and increase productivity. State energy initiatives seek to ensure adequate, affordable, reliable, flexible, and high-quality fuel supplies. These services are essential to maintain and enhance the competitiveness of Tennessee business and industry in an increasingly competitive global economy and to ensure job retention and growth.

The opening plenary, "The Department of Energy's Solar America Initiative" (SAI), <http://www.ornl.gov/solarsummit/presentations/DOEHQsolar.pdf>, was presented by Craig Cornelius, Acting Program Manager of Solar Energy Technologies, Office of Energy Efficiency and Renewable Energy at DOE. The goals of the Southeast Solar Summit align with those of the SAI, which is part of President Bush's Advanced Energy Initiative. In his 2006 State of the Union address (Fig. 3), the President announced plans to specifically promote the solar power as a part of this larger clean-energy initiative:

So tonight, I announce the Advanced Energy Initiative – a 22-percent increase in clean-energy research – at the Department of Energy, to push for breakthroughs in two vital areas. To change how we power our homes and offices, we will invest more in zero-emission coal-fired plants, revolutionary solar and wind technologies, and clean, safe nuclear energy.

The goal is to make solar energy cost-competitive with conventional forms of electricity by 2015. Adding solar energy to our nation's energy mix will increase our energy security through the following measures:

- Providing America with decentralized sources of clean power for the electric grid;
- Improving our environment by avoiding 191,000 tons/year of CO₂;
- Boosting our economy by promoting a U.S.-based solar industry.

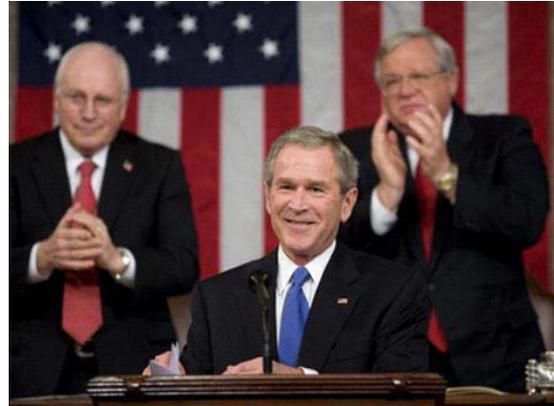


Fig. 3. President George Bush announces the Advanced Energy Initiative at his 2006 State of the Union Address

DOE is leading the SAI effort and will do the following to accelerate the development of cost-effective solar energy technologies that produce electricity and heat water:

- Conduct cost-shared research with industry-led teams and form strategic partnerships with universities, federal and state governments, and other non-governmental agencies;
- Support early-stage companies as they take promising prototype photovoltaic cells from the laboratory to the marketplace, leveraging DOE funding and technical assistance from national laboratories;
- Address non-technological barriers to widespread deployment of solar technologies such as codes, standards, certification, and technical training;
- Establish ENERGY STAR[®] labeling for solar hot water heaters to ensure product performance;
- Facilitate cost reductions in utility-scale concentrating solar power systems by addressing three factors: further technology development, volume production, and scale-up in plant or project size.

Scott Hennessey, Manager of Policy and Research at Solar Energy Industries Association (SEIA), discussed “The U.S. Solar Market,” <http://www.ornl.gov/sci/solarsummit/seia.pdf>. SEIA is the national trade association for the solar industry that works to expand markets, strengthen research and development, remove market barriers, and improve education and outreach for solar. SEIA is focused on:

- Reducing regulatory barriers to photovoltaic (PV) installation through the spread of standardized and technically legitimate standards for interconnection and net metering;

- Increasing markets for PVs nationwide through meaningful and appropriate incentive programs at the state and Federal level;
- Ensuring robust and continuing Federal research and development into photovoltaic devices and supporting technologies (inverters, balance-of system equipment, etc.).

To conclude the opening talks, Suzanne Shelton, President and CEO of The Shelton Group, talked about trends in public opinion for solar technologies, <http://www.ornl.gov/solarsummit/sheltongroup.pdf>. Results from the Group's *Energy Pulse 2007* survey of over 500 individuals demonstrated several challenges and opportunities for consumer acceptance of solar and other renewable technologies. The studies show that consumers are less willing to spend money right now, and they tend to associate "green" with "more expensive." Many surveyed expressed skepticism toward corporations that they suspect are more concerned with sales than contributing to environmental needs. Shelton explained that less expensive energy efficiency measures, such as light bulbs and energy efficient water heaters, are currently more successful than expensive solar products like PV systems. Consumers also expressed the importance of tangible and visible rewards for conserving; otherwise, they will most likely find an excuse not to invest. Many of those interviewed pointed to counter-productive experiences such as reducing water consumption, only to have the utility raise rates because they were not selling enough water. To conclude, Shelton reminded attendees that consumers have become very cost-conscious and prefer to see the fruit of their investment either through reduced up-front costs or increased visible savings like watching their electric meter roll backwards.

The opening activities concluded with the dedication ceremony of the Arizona Public Services single-axis tracking photovoltaic solar array capable of providing 9000 kWh of electricity over the course of a year. The array is located outside of the ORNL Conference Center (where the Summit was held) and uses Memphis-based Sharp Electronic Corporation's photovoltaic modules. Dr. Thom Mason, ORNL Laboratory Director; Robert Hawsey, Director of the ORNL Energy Efficiency and Renewable Energy Program; Anda Ray, TVA Vice President of Environmental Stewardship and Policy; Stephen Smith, Executive Director of SACE; Craig Cornelius, DOE; and Ryan Gooch, ECD, led the dedication ceremony as shown in Fig. 4.



Fig. 4. (Top, Left to right) Stephen Smith, Southern Alliance for Clean Energy; Anda Ray, Tennessee Valley Authority; Helen Hardin, Chief of Staff Congressman Zach Wamp; Thom Mason, ORNL; Ryan Gooch, Tennessee Department of Economic and Community Development; Beth Hickman, Field Representative for Congressman Lincoln Davis; and Craig Cornelius, Acting Program Manager, Solar Energy Technology, Office of Energy Efficiency and Renewable Energy, DOE. (Bottom) Arizona Public Services tracking photovoltaic solar array at ORNL.

Source: Fitzpatrick, 2007

TRACK I: SOLAR RESEARCH AND DEVELOPMENT (R&D) SESSIONS

The opening remarks were followed by Wednesday's Track I sessions focused on all aspects of solar R&D.

Chair: Curt Maxey, ORNL

Moderator: Dr. Craig Blue, Deputy Director for Technology, Materials Science and Technology Division, ORNL

Session 1: Photovoltaics (PV)

Facilitators: Dr. Ron Ott, ORNL, <http://www.ornl.gov/solarsummit/ornlpv.pdf>, and Dr. ViJay Yelundur, University Center of Excellence for Photovoltaics, Georgia Institute of Technology – Presentation, <http://www.ornl.gov/solarsummit/georgiatech.pdf>

Dr. Ott and Dr. Yelundur kicked off the R&D track by highlighting several current activities in PV. As DOE's largest energy laboratory, several unique tools and facilities are available for advanced research in this field. The presenters described two primary goals that they and other experts in the field are working to accomplish. First, a reduction in the number of defects is needed in solar cell materials. Such defects are directly correlated to efficiency of PV materials. Georgia Tech now has scale-up capabilities to produce commercial size (149 cm²) solar cells that exhibit very few defects and little drop-off in efficiency (18.5%) as shown below in Fig. 5.

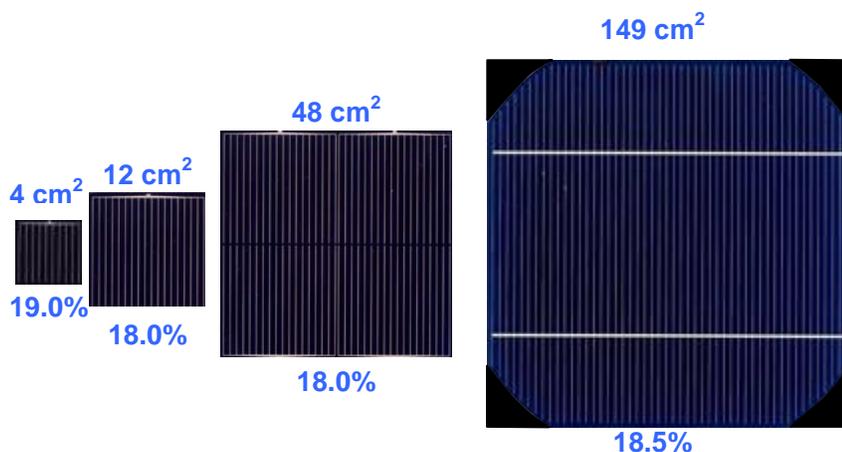


Fig. 5. Scale-up of solar cell production at Georgia Tech
Source: Yelundur, 2007

Yelundur noted that this percentage is rising rapidly mostly due to high quality electrical contacts. As the researchers' second goal, improvements in these contacts were optimized through a type of firing scheme. Georgia Tech and ORNL have teamed up and are working to achieve these goals using various imaging techniques, modeling systems, calculation of voltage losses, and pulse heat treatments. A ROADMAP has been developed that aims at reducing costs to under 10¢/kWh within the next three years. In this same timeframe, the presenters expect to see multi-crystalline silicon cells with 18-19% efficiency.

Session 2: Building Integrated Photovoltaics (BIPV)

Facilitators: Steve Coonen, Vice President, Business Development, Open Energy Corporation and Dr. Lew Fraas, President, JX Crystals, Inc. – Presentation, <http://www.ornl.gov/solarsummit/JXcrystals.pdf>

In this session, Steve Coonen and Dr. Lew Fraas discussed how BIPVs could play a role in the reduction of cost per kWh that would ultimately lead to solar power becoming cost-competitive without the need of incentives. Coonen focused on fully integrated PV, where the PV modules function as a portion of the building roof or walls. Examples Coonen presented were architectural glass panels with embedded solar cells and roof tiles with integral solar cells. Coonen described how this approach enabled conventional contractors to install the PV, eliminating the need for specialized solar contracting teams.

Fraas described the advantages of using low-cost tracking systems to increase the efficiency of roof-mounted PV systems. He described the use of single-axis carousel trackers that can increase the output of the solar panels by up to 40% (compared to a fixed array of modules) by following the sun throughout the day (Fig. 6). These carousels are designed for use on flat rooftops to optimize the amount of light captured. To make his point that these carousels could be very cost effective, he pointed out that they were fundamentally no more complex than a washing machine and thus should be able to be produced in quantity for a few hundred dollars. At high volume manufacturing, Dr. Fraas expects carousels to cost approximately \$0.33/W or \$80/sq ft (labor and materials) as opposed to \$1/W if custom produced.



Fig. 6: 1-Sun Carousel Tracking Module.

Source: Fraas, 2007.

Coonen summarized the session by showing links to a calculator called PVWatts on the National Renewable Energy Laboratory (NREL) website that can be used for estimating the performance of PV installations (http://rredc.nrel.gov/solar/codes_algs/PVWATTS/version1/). The presenters note that a tradeoff does exist between reducing costs and increasing efficiency, and PV is not a universal answer.

Session 3: Concentrator Photovoltaics (CPV)

Facilitator: Dr. Lew Fraas, JX Crystals, Inc. – Presentation, <http://www.ornl.gov/solarsummit/Carousel.pdf>, Bob Conner, Semprius – Presentation and Rick Hurt, University of Nevada Las Vegas (UNLV) – Presentation, <http://www.ornl.gov/solarsummit/UNLV.pdf>

This session consisted of three complementary presentations, leading off with a continuation of Dr. Fraas' thesis of reducing the current PV rate of 28¢/kWh down to 7¢/kWh via a three-tiered approach. Fraas suggested that the cost of PV modules can be reduced by a factor of

two using simple reflectors to concentrate the sun, thus replacing the expensive solar cell material with inexpensive metal mirrors. This is accomplished by constructing modules with half-size cells lined with mirrors (Fig. 7). Fraas also noted that subsidies are helpful for successfully launching products into the market, but dependence upon them may lead to market instability.

Rick Hurt followed with an overview of CPV and other solar projects taking place at UNLV's Center for Energy Research. The geographic location of the Center offers many opportunities for solar research since Nevada receives among the highest amounts of solar energy in the country. One feature project at the Center is the Amonix High Concentrating Photovoltaic (HCPV), a multi-junction cell 25kW installation with 25-29% efficiency. Additional research at the center includes solar dish stirling, concentrated solar thermal, hybrid solar lighting, energy efficient homes, advanced building technologies, photoelectrochemical hydrogen generation, and modeling and computational methods.



Fig. 7: JX Crystals 3-Sun Mirror Module.

Source: Fraas, 2007.

Bob Conner wrapped up the CPV session by describing Semprius' Photovoltaic Microtransfer Printing Technology.

This technology allows the application of very small solar cell sizes (0.1 x 0.1 mm compared to present 10 x 10 mm) onto wafers that will then be printed on a target substrate. This quality creates a simpler method of acquiring uniform illumination, extracting current, and removing heat. The technology also enables the use of inexpensive, microlens arrays with very large concentration ratios (>1,000x) on thin lightweight conformal modules. Cost reductions are possible through the re-use of a parent wafer. Conner expects a prototype of a CPV module by early 2008.

Session 4: Buildings and Grid Integration

Facilitators: Burak Ozpineci, ORNL and Tom Jahns, University of Wisconsin – Presentation, <http://www.ornl.gov/solarsummit/UNwisconsin.pdf>

This session discussed the key factors that are necessary for proper integration between buildings and the grid. The presenters stressed the importance of a multidisciplinary approach that includes the participation of industry, academia, and national laboratories. Cooperative efforts are needed in order to raise priority of sustainable buildings in DOE R&D plans. The presenters also reminded attendees that long-term success of PV requires system-level development in addition to cell/module development.

One example of such collaboration is the Center for Power Electronics Systems (CPES) composed of 76 industry partners and five universities. The primary objective of this Center is to seek major advances in power electronics technology using integration as a key technique to achieve major improvements in performance, reliability, and cost. The Center currently has a

sustainable testbed at Virginia Tech and will begin operation at a CPES sustainable building demo at UW-Madison in 2009. The presenters believe that more successful demonstrations are needed to improve future sales. They also suggested cost share of demos by industry participants since government programs often will not offer support that deep into the commercialization phase.

Session 5: Solar Research Needs for Utilization beyond Conversion

Facilitator: Jeff Muhs, Director, Strategic Planning, Engineering Science and Technology Division, ORNL, <http://www.ornl.gov/solarsummit/directsolar.pdf>

Jeff Muhs completed the R&D track with a look at opportunities via the direct use of solar power. Typically, people associate solar energy with capturing sunlight, converting it to electricity, and storing it for future use. However, Muhs urges attendees to look outside of the box for alternative and disruptive technologies, such as the distribution of the energy collected from the sunlight for direct use in multiple applications. For instance, direct use of sunlight, whether UV, visible, or IR rays, can be applied to lighting, as in the ORNL Hybrid Solar Lighting technology, production of biomass in photobioreactors, decontamination of water, and photodynamic therapy for medical applications.

Direct heating can be used as a source for radiant heating of office buildings. Solar power can even be converted photoelectrically to hydrogen or into UV phosphors for interior lighting. Muhs suggested that someday photons may be net metered/sold in addition to electrons. He reminded the audience that PV systems are currently used to convert sunlight back into light and heat at lower efficiency and suggested that this may be a smarter method for approaching these needs (Fig. 8).

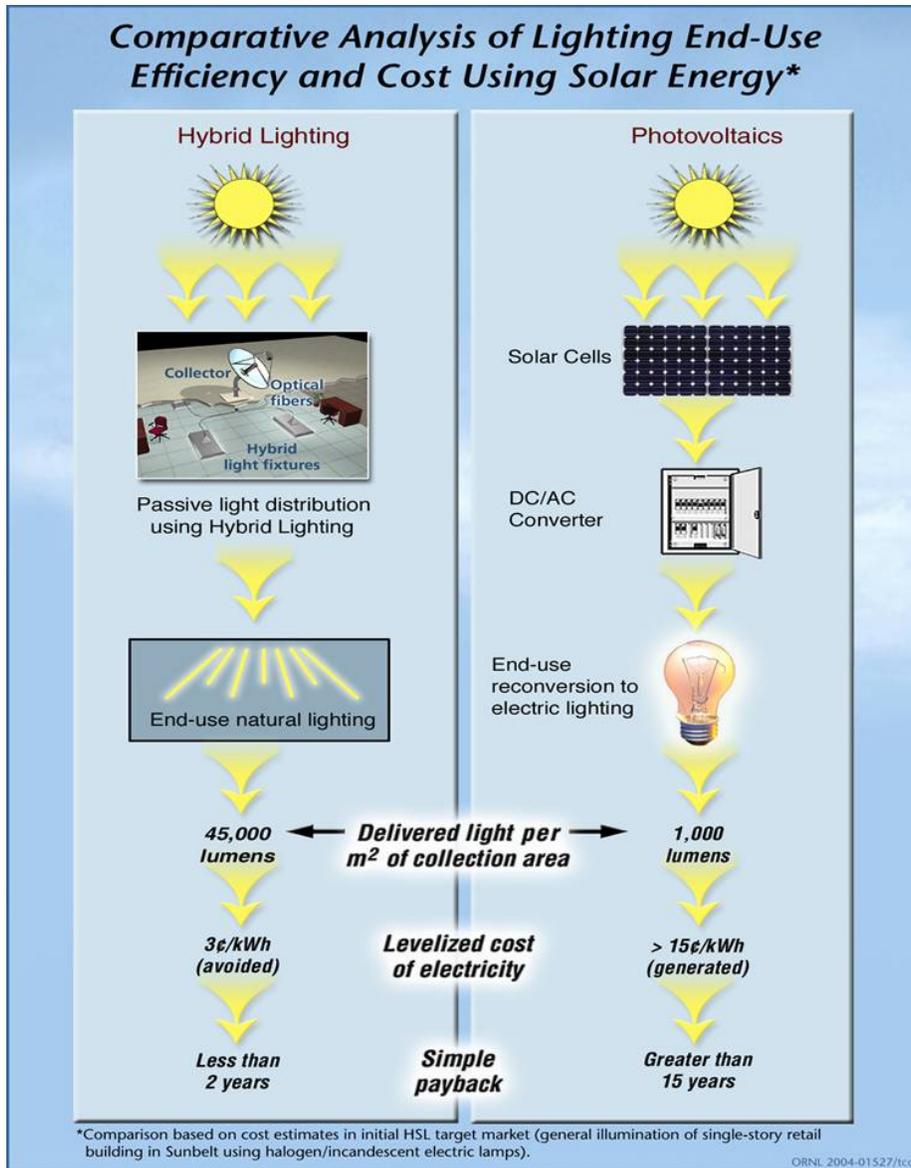


Fig. 8: Efficiency comparison of hybrid lighting and photovoltaics.
 Source: Muhs, 2007

TRACK II: SOLAR MARKET TRANSFORMATION AND ECONOMIC DEVELOPMENT SESSIONS

Wednesday's Track II sessions focused on market transformation needs for solar and other renewables specific to the Southeast.

Chair: Gil Melear-Hough, Southern Alliance for Clean Energy (SACE)

Moderator: Kevin Lynn, Sentech, Inc./ DOE, Solar Energy Technologies Program

Justifying the Cost of Solar

Dr Ross McCluney, Florida Solar Energy Center, <http://www.ornl.gov/solarsummit/FSEC.pdf>

Monetary factors are only one aspect to consider when making solar investment decisions. Non-monetary factors, including improved public health and productivity, the spending of our own capital, general ecosystem health, and future energy prospects, must also be added to the equation. Unfortunately, these factors are difficult to quantify, and consumers cannot easily visualize the savings. End-users are also deterred by high initial costs associated with purchasing solar technologies.

A sense of urgency surrounding climate change and consumption of resources currently exists. McCluney believes that we are systematically taking apart our life support system, pushing up against natural limits that are starting to break. He noted that government action is critical to address these issues; therefore, our leaders must be educated to set appropriate policy and pass laws to support that policy. Two approaches were suggested for market restructure: market-based and legislative/regulatory. The market-based approach aims to educate individuals about the problem, provide design assistance, and offer financial incentives to encourage technology adoption. The legislative/regulatory approach presents an all-encompassing plan of action for manufacturers, distributors, utilities, local government, and the public. Tennessee and the rest of the Southeast states have all received grades of either "C" or "D" on their Renewable Energy Report Cards, and they must join the effort of already engaged states and regions to make the market restructure a nationwide movement. For more information see: "Plugging In Renewable Energy: Grading the States"

http://go.ucsusa.org/clean_energy/renewable_energy/page.cfm?pageID=1180. A December 2007 "Freeing the Grid" report also highlights state report cards <http://www.newenergychoices.org/>.

Installer Certification and Training

Allan Gentry, North American Board of Certified Energy Practitioners (NABCEP), <http://www.ornl.gov/solarsummit/certification.pdf>

NABCEP is a voluntary installer certification and training program that educates and prepares individuals for all aspects of PV installation, including design, installation, maintenance, and troubleshooting. Gentry stressed that the U.S. State Department and DOE should be supporting the development of such programs. A show of hands determined that only two of

over 50 attendees were NABCEP-certified. Gentry also noted that well-educated installers were extremely important at a time when PV has not reached maturity and is eager to gain consumer acceptance. It is critical that end-users are fully-satisfied with their installation, because the story of a bad experience will spread much faster than that of a great experience. Code inspectors must also be educated of installed systems.

Installers are typically recruited out of high schools and community colleges, and the Southeast currently has less than 10 training programs. Several audience members questioned the recruiting targets for such programs, concerned with why highly educated individuals (e.g., master electricians) did not already have the necessary skills. Gentry noted that NABCEP covered many aspects with which electricians would not be familiar, including roof geometry, shading, array placement, and promotion of lifestyle changes through the use of renewables (Figure 9). A knowledge gap of renewables often exists by electricians, which may lead to a poor system recommendation. Also, professionals typically do not want to take time away from a profitable business to sit through training. Gentry finally noted that interested individuals are not required to attend training in order to become certified. In fact, study guides can be found on the NABCEP website at <http://www.nabcep.org/pvresources.cfm>.

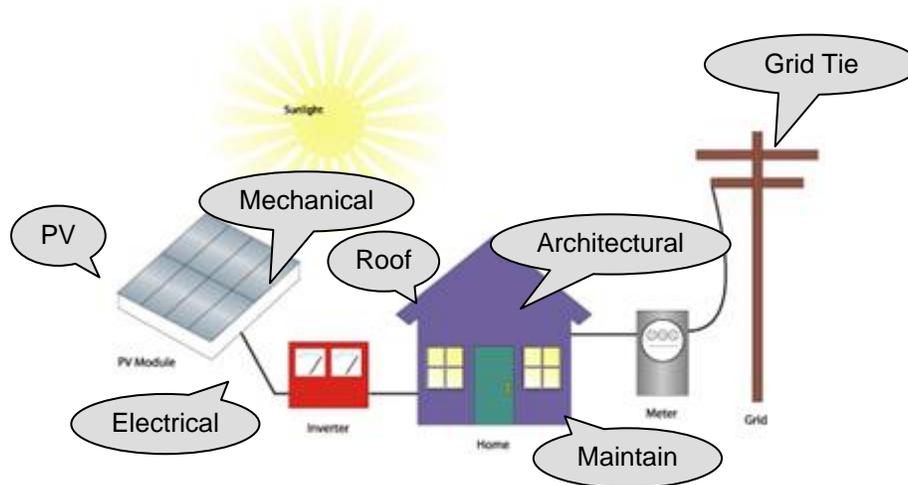


Fig. 9: Various aspects of which PV installers must be knowledgeable.
Source: Gentry, 2007.

Solar Success Stories & Lessons Learned

Each panelist provides an overview of successful approaches and future opportunities for growth.

John Morris, President and CEO, Sunlight Direct,
<http://www.ornl.gov/solarsummit/sunlightdirect.pdf>

Sunlight Direct's Solar Platform consists of three primary applications: Hybrid Solar Lighting (HSL), BioReactors, and CPV. The concept for this platform's core technology originated at ORNL. Beginning as a relatively small start-up company, the founders believed it was important to focus initially on one application (in this case HSL) and later branch out to secondary applications once the first had ample time to incubate and successfully penetrate the marketplace. HSL has recently graduated from beta phase into the demonstration phase with installed systems in several participating locations nationwide, including Wal-Mart, Staples,

Battelle, and San Diego State University. Multiple luminaire and installation options have been created to accommodate customer needs.

Morris explained the company's customer growth process consists of three phases. First, demonstration units should be sold and installed, and collected experience from these units should be used to determine specific customer and regulatory needs. The second phase involves the installation of multiple units, and customer value propositions can be identified based on these installations. Once these value propositions have been incorporated into the company's business model, the product is prepared for its final transition – scale-up to mass market.

Morris acknowledged that the company's biggest challenge to date has been controlling the large amount of heat generation that sometimes occurs when concentrating so much sunlight. Prompted by question from the audience, Morris explained that the introduction of LEDs appears to be a complementary technology, not competitive.

Jeff Curry, Alternative Energy Coordinator, Lakeland Electric,
<http://www.ornl.gov/solarsummit/lakeland.pdf>

Known for its Pro Solar Early Adoption Programs, Lakeland Electric is the third largest municipal utility in Florida with over 120,000 metered customers. Lakeland owns and operates solar streetlights, grid-linked PV systems, and metered solar water heaters. The company encourages its customers to take advantage of the benefits from their Solar Water Heating Program. Lakeland has also installed over 60 systems, and since Lakeland buys, owns, and installs the systems, the customer essentially acquires no investment risk and simply pays for the generated energy as needed.

Lakeland is the first utility to ever produce and trade renewable energy credits derived from solar water heaters in the form of “green tags.” In fact, Keys Energy Services of Key West and the 2004 Democratic National Convention bought 50 MWh from the Lakeland for \$40/MWh. In 2007 Sterling Planet issued a Certificate of Environmental Stewardship for providing 20,000 kWh of Solar Energy (50% Solar Hot Water–50% Solar PV) to the American Solar Energy Society's Solar 2007 Conference, shown in Fig. 10. Lakeland Electric installs a utility-grade Btu meter. At Lakeland's request, the meter manufacturer has reprogrammed the meter internally so that it displays KWh. In essence this meter translates thermal energy into electrical energy and expressed the energy in KWh (3412 Btuh = one KWh). Lakeland plans to expand its program in 2008 by creating an Integrated Resource Plan (from annual budget), Conservation Benefits Fund (\$0.25 monthly), and voluntary green pricing (\$5.00/100 KWh block).



Fig. 10: Certificate of Environmental Stewardship

Solar America Initiative (SAI) – Market Transformations

Kevin Lynn, Sentech, Inc. / U.S. Department of Energy Technologies Program,
<http://www.ornl.gov/solarsummit/DOEsolar.pdf>

SAI coincides with President Bush's vision of making solar technologies cost-competitive across all U.S. markets by 2015. SAI would like to see PV capture approximately 30% of all new energy installation (roughly 5-7 GW annually). While this goal can be achieved in part by reduced cost via R&D, Lynn spoke to the necessary market transformations that will also play a large role. First, he believes that relationships must be built with state policy-makers that hold influence on the future of solar technology, and they must be educated in best practices around the country and current data in order to make informed solar policy decisions. Also, utilities should have access to technical and informational assistance so they will support and promote the use of solar in their regions. SAI promotes project-based (SA Showcases) and citywide partnerships (SA Cities) to demonstrate the possibility of a sustainable solar infrastructure.

Lynn agreed with Cornelius' previous statement that identified energy storage in CSP as a major challenge – one that ORNL could play a large role in addressing. SAI anticipates approximately 10 GW of solar energy produced worldwide in 2010 and breakthroughs in storage will help to accommodate such growth.

Energy Efficiency, Solar Opportunities and Sustainable Benefits for New Home Construction

Elizabeth Eason, AIA, LEED AP, <http://www.ornl.gov/solarsummit/LEED.pdf>

Eason opened her presentation with a brief introduction to the US Green Building Council's LEED Rating Systems, which according to Eason are "the nationally accepted benchmark for the design, construction, and operation of high performance green buildings." The US Green Building Council promotes a whole building approach towards sustainability with five core areas of human and environmental health: sustainable sites, water efficiency, energy efficiency, indoor quality, and materials and resources.

Eason used two of her architectural firm's residential projects as case studies of a "whole building" approach to design. In both residences, the first step is to ensure that the home is properly orientated on the site for maximum passive and active solar benefits. Then the house is designed to be very energy efficient through careful envelope detailing, excellent insulation, properly sized equipment, and highly efficient fixtures and appliances. Water quality and quantity are increasing concerns in the US, and good residential design can incorporate reduced water usage, water collection and reuse, and water filtration.

The sustainable benefits of a whole building approach for residential design include super energy efficiency, healthy indoor air quality, water efficiency, plentiful natural light and ventilation. An integrated approach to residential systems will also result in smaller HVAC systems, solar arrays and reduced maintenance. For more information on the US Green Building Council see <http://www.usgbc.org/>.

National and State Incentives

Steve Kalland, Director, North Carolina Solar Center (NCSC),

<http://www.ornl.gov/solarsummit/NCSC.pdf>

After an introduction to the North Carolina Solar Center, Kalland presented an overview of financial incentives that have been established for the promotion of solar technology deployment and to help end-users overcome high upfront costs associated with these technologies. A variety of state financial incentives, including rebates, tax credits and low-interest loans have been created but Kalland noted that only about half of states have chosen to adopt such incentives. Some states offer tax and other incentives as a way to encourage renewable energy equipment manufacturers to locate in the state.

Kalland also noted that the Southeast is among the least engaged when it comes to state incentive and policy participation for solar technologies but stresses that many opportunities are available, especially net metering. In fact, Tennessee is one of six states that do not currently have a net metering provision. Kalland offered North Carolina as a potential benchmark for Southeast states where an \$80,000 system costs approximately \$16,000 after Federal and state tax incentives and depreciation.

Renewable Portfolio Standards

Stephen Smith, Southern Alliance for Clean Energy (SACE),

<http://www.ornl.gov/solarsummit/SACE.pdf>

According to Smith, Federal action will be the key driver for slowing global warming and initiating change in energy policies. Smith examined expected modifications to be made in Washington, DC, in the near future that may play a role in both addressing global warming and promoting clean energy technologies. In particular, the Southeast is home to several natural wonders, including the Great Smoky Mountains, the Everglades, and unique coastlines that are threatened in some way by unpredictable climate changes in the future. In fact, the Southeast could be the region hit the hardest by climate change in the U.S.

For more information see:

http://news.nationalgeographic.com/news/2005/08/0811_050811_climatechange.html

<http://www.usgcrp.gov/usgcrp/Library/nationalassessment/overview.htm>

http://www.pewtrusts.org/uploadedFiles/wwwpewtrustsorg/News/Press_Releases/Global_warming/pew_climate_synthesis_042804.pdf

Smith commends leaders within our region that have stepped up to the plate when Federal leadership has been slow to initiate change. While Florida and the Carolinas have taken actions within their states, Smith believes that a systematic change at the Federal level is needed to tackle global warming and create incentives for clean energy technologies. Smith urged attendees to contact their representatives and senators and ask them to support meaningful climate and energy legislation to address global warming, reduce our dependence on fossil fuels, and promote solar and other renewable energy technologies.

The Role of Utilities Renewable Energy Green Power Programs

Edward Colston, Tennessee Valley Authority, <http://www.ornl.gov/solarsummit/tva.pdf>

TVA's Green Power Switch program and GPS Generation Partners were the primary topics of Colston's presentation. A flow diagram of the program is shown in Figure 11 on the following page. TVA initiated these programs in April 2000 as a means to help reduce utility environmental footprint, promote technology/infrastructure development, stimulate market/supplier development, and minimize non-participant impacts. TVA hopes that this can be a model for other utilities with similar objectives. Colston described many design considerations, including price, availability and resource ownership, of TVA's Green Power Switch program, which adds renewable sources to the Tennessee Valley's power mix and currently credits \$0.15/kWh to all solar generated on site whether used on site or not. Similarly, TVA is considering several potential provisions of the GPS Generation Partners program (which is set to expire on December 31, 2008) in order to best serve participants. This is a dual meter program. The first meter serves as the net meter and the second meter (meter B in below figure) is the solar meter that measures all the solar generated on site. The sum of both meters is what the house uses and the what the homeowner will pay according to their current residential rate for electricity. The B meter is used to determine their solar credit.

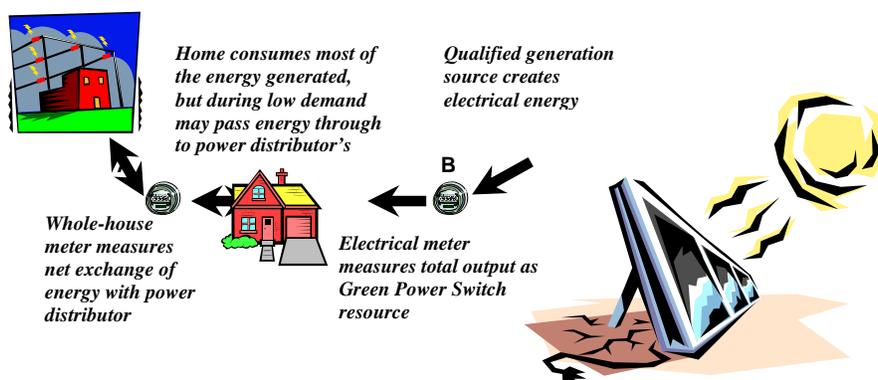


Fig. 11: TVA's Generation Partners flow diagram.
Source: Colston, 2007.

The Role of Non-profits in Market Transformation

Alex Tapia, Kilowatt Ours, <http://www.kilowattours.org/index.php>

Kilowatt Ours, an advocacy documentary film created by Jeff Barrie and the Southern Energy Conservation Initiative, has grown into the Nashville-based organization of the same name. The organization has a plan to re-energize America by educating individuals (mostly 4th-12th graders) about the production and use of their electricity. Tapia believes that a generational change is needed, and this audience represents that generation. Clips from the documentary showed linkages between the average homeowner's energy use and mountain top removal coal mining, climate change, and nuclear power. Film clips also demonstrated several simple ways to save money via conservation, therefore, reducing their demand for unsustainable energy. Tapia also works with policy makers, utilities (including TVA), and distributors to help convey the potential of Green Energy.

Summary: Need for Southeast Regional Plan

An outline of a southeast regional plan for solar and renewable energy market transformation was initiated during a brainstorming session facilitated by Scott Hennessey, SEIA Manager of Policy and Research. Takeaways from this session and others include short- and long- term goals at both the state and Federal level that are necessary to establish the Southeast as a leader and supporter of solar and other renewable technologies use. In addition to the market transformation takeaways, key points from the R&D track have been summarized, including the need for new or expanded research, development, demonstration, and deployment (RDD&D) regional partnerships.

A list of areas from both tracks in need of strengthening and the associated action items for the region is presented below.

- *Need for Education*
In order for solar technologies to become common practice, individuals must first be knowledgeable of solar capabilities as well as the opportunities that they can offer people and their communities. Many people are affected by the use of solar technologies including the general public, end-users, elected officials, and utilities; therefore, educational resources should be available to those who wish to learn more. Some school programs and company-led efforts (e.g., Sharp Solar) have been created to help educate K-12 students, but an increase in these topics is strongly encouraged.
- *Need for Skilled Workforce*
As interest in integrated solar technologies increases, more knowledgeable technicians will be needed to properly install systems. Several contractors in the audience expressed concern for a declining skilled labor force that is insufficient to build most traditional houses much less houses with integrated modern efficiency systems. Many attendees believe that more vocational training programs are needed to address this issue. Currently, NABCEP certification is voluntary, but the hope is that a large enough workforce in the future will lead to mandatory certification that will ensure correct installation and satisfied customers.
- *Need for a Solar Champion*
Several Summit speakers stressed the importance of identifying a solar champion within the region, perhaps an elected official or university representative, that is passionate about the use of solar and other renewable energy and is willing to “step up to the plate” to see that change does occur. One attendee noted that regions always have plenty of “show horses” but what is truly needed are dedicated “work horses.”
- *Need for Two-Front Approach (State + Federal)*
When planning for market transformations, coordinated and aligned approaches must be defined at both the state and Federal level since both play a vital role in initiating change within communities. For example, one attendee inquired about the possibility of introducing Renewable Energy Credits (RECs) in Tennessee. While most regions address this issue at the state level, most of Tennessee’s power is controlled by TVA, which is a Federal entity, and it is unlikely that they will administer RECs unless a Federal policy was established. Many audience members believe that TVA has the

opportunity to use their power to develop new models that may include RECs, net metering, etc.

Individual Southeastern state leadership has helped establish standards, guidelines, and models for renewable energy, especially in Florida and North Carolina. One speaker reminded the audience that everything done on the Hill is a result of individual states pushing for initiatives, so states must do their part to support change in their area. The coordination of more regional conferences and solar decathlon-like events could be a way to raise awareness and connect regional players.

- *Need for More “Zero (or Near Zero) Energy” Houses/Communities*
By increasing the number of Zero Energy Houses in the region, attendees expect to increase visibility of solar technologies, and many believe that such buildings would help demonstrate that benefits from integrated solar are attainable. Currently, no stand-alone communities exist in the Southeast. The Walden Reserve Development (described on page 23) may be the first in the region to accomplish this. Other grid-tie models in California, Nevada, and New Mexico offer available benchmarks. Utilities would benefit from these communities and are valuable allies in the development. Some neighborhoods in the region have made commitments to incorporate some type of solar onto rooftops.
- *Need for Effective Marketing*
Many Summit attendees expressed the importance of effective marketing campaigns that strongly encourages the use of renewable energy.
- *Need for More Companies within Region*
One method of establishing the Southeast as an industry leader may be to encourage solar technology companies to expand their operations (e.g. manufacturing facilities) in the region. As a result, the region would see an increased technically-skilled labor force and presence within the industry.
- *Need for New or Expanded RDD&D Partnerships*
Areas of interest:
 - PV defect minimization collaboration with industrial partners to arrive at cost effective methods for mitigating defect densities. Characterization facilities in the ORNL CATS lab could play a major role.
 - CPV performance characterization in the southeast hazy sky conditions will be important for understanding the role of high and low-concentration CPV in the region. Overall reductions in “balance of system” (i.e. non-PV portion) will be important. Development of low-cost trackers and low-cost optics could be a focus area for collaboration between industry and university or laboratory partners.
 - BIPV development of reliable building envelope systems incorporating PV is an area for continued development. ORNL Buildings Technology Center could play a role in materials evaluation and development.
 - CSP energy storage is a key area for R&D because of the potential for offsetting peak demand to utilities.
 - Power electronics/ interconnection /grid integration.

- New innovative ways to utilize the power of the sun.

RDD&D near-term follow-up opportunities include:

- DOE EERE Solar Energy Grid Integration Systems (SEGIS) request for proposals - closes in January.
- DOE EERE Solar Cities solicitation - closes in January.

Many new relationships were formed at the Summit and collaborative opportunities are being pursued. If you would like to discuss any follow-up RDD&D ideas or concepts, please contact Melissa Lapsa (865-576-8620).

To summarize the points above, market transformation is achievable at all levels (e.g., home, community, state, and Federal), and Summit speakers repeatedly urged attendees to take action by calling their elected officials and expressing interest in their increased participation and support of renewable energy. The Southeast has many strengths and opportunities to offer, including a wealth of research facilities across universities and a national laboratory for continued advanced R&D, participation in Green Power programs, and promotion of renewable energy companies to the region. As a region, the Southeast has gotten a relatively late start within this industry, but many benchmarks are available nationwide to help catapult the region among solar and renewable energy leaders. These and other Southeast characteristics as related to solar technologies are recapped in Table 1.

Table 1: Southeast Strengths, Weaknesses, Opportunities, and Threats (SWOT)

<p>STRENGTHS</p> <ul style="list-style-type: none">• Strong presence of research facilities across universities, and the national laboratory.• Many benchmarks available nationwide that can be replicated• Growing interest by consumers, utilities, and policy makers• Engaged utilities encouraging participation in Green Power programs	<p>WEAKNESSES</p> <ul style="list-style-type: none">• Lack of state and Federal policies and incentives• Less solar intensity than the Southwest• Late start in industry; much catching up to do
<p>OPPORTUNITIES</p> <ul style="list-style-type: none">• Continued R&D to improve material efficiency and reduce material costs• Encourage expansion of solar and renewable energy companies into the region (e.g., manufacturing facilities)• Increase education and installer training• Increase visibility through more demos and effective marketing	<p>THREATS</p> <ul style="list-style-type: none">• Fiscal uncertainties• Possible modifications to established Green Power programs by utilities• Communication gap between citizens and policy makers

Keynote Addresses

Steve Coonen, Vice President, Business Development, Open Energy Corporation, delivered the first keynote speech of the Summit during Wednesday's lunch, <http://www.ornl.gov/solarsummit/presentations/ORNL-Coonen.pdf>. His topic, Buildings Integrated Photovoltaics (BIPV), covered the challenges and opportunities associated with *integrating* PV with new and existing buildings. Coonen described the ultimate goal to be the replacement of building materials with solar components, such as PV systems incorporated into roofing, skylights, and architectural glass. By doing so, materials and installation costs can be dramatically reduced. The use of on-site contractors can also cut costs and ensure that building codes are being met. A variety of materials (e.g., crystalline, polycrystalline, amorphous silicon) and configurations (e.g., roof tiles/shingles, rack mounted, spandrel) were described along with the aesthetic features that architects can incorporate into their design and vision.

Mike Taylor, Technical Services Manager, Solar Electric Power Association (SEPA), presented a National Review of Solar Electric Power Integration during Wednesday night's dinner, <http://www.ornl.gov/solarsummit/sepa.pdf>. Overall, the U.S. is making great strides towards becoming an international player in solar technologies with steady growth in grid-tied PV installations and MWs led by California and New Jersey. However, Taylor described solar development in the U.S. as in its "teenage" stage. In order to fully mature, the country must strengthen in four primary areas: technology, policies, markets, and utilities. The solar resources in the U.S. easily exceed that of leading countries, such as Germany, but installation costs are approximately twice as costly. Taylor stresses that long term, consistent, and standardized policies are needed to accelerate volume, competition, learning curves, manufacturing investment, and research innovation.

Jeff Muhs, Director, Strategic Planning, Engineering Science and Technology Division, ORNL, delivered the final keynote address during Thursday's lunch about working "Towards a More Transformational Solar Energy R&D Portfolio," <http://www.ornl.gov/solarsummit/solarenergy.pdf>. A strong interest has been expressed for a transformation in America's energy R&D portfolio, and many believe that solar energy is an area where transformational research could have a significant impact. To accomplish this, scientific knowledge, materials, and processes must be applied to known energy system needs and problems. Experts must look outside the box and envision what future energy systems might encompass, such as new applications for direct solar use. Muhs believes that transformational ideas typically originate with individuals that have little or no vested interest in existing system or R&D pathways, and insiders having established personal and/or institutional interest in these areas are the individuals who often resist new ideas.

SECOND DAY PLENARY SESSIONS

Building Solar in the Southeast

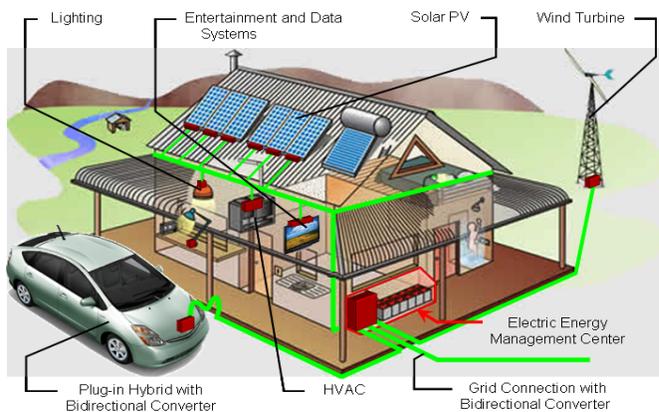
Facilitator: Dr. Robert Shelton, Sr. Associate for Energy Policy, Howard Baker Center for Public Policy, The University of Tennessee

Brian Hensley and Clint Berry of the Tennessee Department of Economic & Community Development (ECD), Energy Policy, kicked off the closing day of the Summit with a “Tennessee Perspective on Solar Incentives and Outreach,” <http://www.ornl.gov/solarsummit/TNeconomics.pdf>. Governor Bredesen, a strong supporter of alternative fuels and cleaner renewable energy resources, has the goal of establishing Tennessee as an industry leader and is looking for ways to expand manufacturing and job growth within the state. Many benefits and opportunities would arise as a result, including small business development and a higher-paid technical workforce. Hensley noted that many resources and institutions already exist in Tennessee, including multiple University of Tennessee campuses, ORNL, several fuel cell manufacturing and R&D companies, and Sharp Solar.

As a major step towards this goal, the ECD is offering the \$4 million Tennessee Clean Energy Grant program for businesses (and potentially schools) to increase the use of renewable and other clean energy technologies as a supplement to fossil fuels. Many systems are eligible, such as PVs, solar thermal water heating, wind energy, hydrogen fuel cells and hybrid solar lighting.

Herb Stonebrook, Energy Management Administrator, Tennessee Department of Finance and Administration, complemented Bredesen’s goal in his “Building Solar into Commercial Buildings” presentation, <http://www.ornl.gov/solarsummit/TNfinance.pdf>. Stonebrook identified the greatest challenge of increasing the use of BIPVs in Tennessee to be the identification of an “Energy Champion” that promotes the incorporation of solar technologies into new and existing buildings and urges local leaders to make citywide commitments. Cookeville, TN, has made such a commitment by becoming a “Cool City” and applying solar panels to a health facility that is highly visible from Interstate 40. Jeff Christian, Director of the Buildings Technology Center at ORNL, believes that the construction of Residential Zero (or near Zero) Energy Buildings provides another opportunity for cities to support Bredesen’s goal, <http://www.ornl.gov/solarsummit/TNfinance.pdf>. Such homes can operate daily for less than one dollar a day. An example of a residential Zero-Energy Building is shown below in Fig. 12.

Fig. 12: Example of a highly-integrated residential Zero-Energy Building with solar technologies incorporated. Source: Jahns and Ozpineci, 2007.



The Walden Reserve Community Development, presented by Paul Radtke, Director of Community Relations at Walden Reserve, LLC, provides another example of such a commitment, <http://www.ornl.gov/solarsummit/walden.pdf>. Walden Reserve is a Deep Green Community that will be located on heavily forested ridges between Black Mountain State Park and Ozone Falls State Park. The community will be self-contained with its own water, energy supplies, and sewer system. The Reserve is expected to accommodate 20,000 residents and house restaurants, retail and office space. The area is serviced by Volunteer Energy Cooperative (part of TVA). The Reserve will act as a test bed for green products and services. The development of the Reserve is guided by 12 bedrock principles (Charlotte, please add from his presentation in a short table –it’s on slide 10 of 19) to ensure environmental responsibility and will hopefully be used as a benchmark for future Deep Green Communities.

Industry Roundtable – Renewables and Success Stories

Facilitator: Tom Ballard, Interim Director, Technology Transfer and Economic Development (TTED), ORNL

Mel Jones, Sterling Planet’s President and CEO, was the first to present in the roundtable, <http://www.ornl.gov/solarsummit/sterlingplanet.pdf>. He began his presentation by describing Sterling Planet’s business model that has led the company to become the nation’s leader in renewable kWh sales. Since its creation in 2000, Sterling Planet has sold over 14 billion kWh (comparable to 1.4 million residential customers) of green energy in the form of renewable energy certificates (RECs), White Tags™ and Carbon Credits. The company has sold RECs to six of the ten top purchasers of renewable energy, including the largest transaction in U.S. green energy history to Pepsi. Jones noted that corporations want to be able look into the eyes of their customers and prove that they care about their future and the environment and that purchasing renewable energy is an effective approach. Studies show that the use of renewable energy is attractive to corporations because it offers a way to differentiate their products – plus, it is simply the right thing to do. In addition, Jones believes that much of his company’s success stems from its strong relationships with utilities and commitments from universities.

Steve Johnson from LightWave Solar Electric provided an overview on what action must be taken in order for the residents and businesses of the southeast to “warm up” to solar technologies, <http://www.ornl.gov/solarsummit/sterlingplanet.pdf>. Johnson first noted that the region has several resources available, including manufacturing facilities, strong solar intensity, and maturing residential and commercial incentives. In order to achieve continued growth, several additional steps must be taken. First, Johnson stresses the importance of responsible design and installation, which requires knowledgeable and NABCEP-certified PV installers. If systems do not perform well due to improper design or installation, the public will have a negative perception of PVs, which could be detrimental to the industry that is still in its early stages. Johnson also believes that it is extremely important that the TVA Generation Partners program does not reduce its purchase rate below 15 cents/kWh since this is such a critical incentive for homeowners and small businesses to install wind and solar generating capacity. More state incentives geared towards assisting schools, new buildings, residential, and non-profit organization are also needed. Finally, Johnson encourages

architects to incorporate “solar ready” roofs into their designs and discuss possibilities with clients.

“Is the Next Step Exporting?”

Facilitator: Kay Thompson, Office of Policy and International Affairs, U.S. Department of Energy, <http://www.ornl.gov/solarsummit/Kay%20Thompson.pdf>

In this session, the potential for U.S. exports of solar technologies was discussed. Ms. Thompson reminded attendees that the “solar century” has begun as demonstrated by the young entrepreneurs that participated in October’s Solar Decathlon. Thompson also acknowledges that when major oil suppliers like Kazakhstan and Azerbaijan begin constructing wind power stations and investigating in solar hot water heaters and hybrid systems, an international movement toward renewable technologies is truly taking place. In fact, the countries of Central Asia have formed an EcoEnergy Alliance that actively promotes the trade of solar technologies developed by the region’s scientists. Because of the evolving definitions of energy security, escalating oil and gas prices, and growing concern of the environmental impact of using gas and oil, a new look at energy policy is needed.

Thompson believes that the exporting of solar technologies offers an opportunity for those in the audience who have devoted time and money developing new technologies for commercial use. Two tables provided by Energy Information Administration show that the largest market for such U.S. exports of PV cells and modules is Europe because of the ease of doing business. India and China are also major markets for PV technology and have less competition from established European countries, including Germany and Spain. The best markets for solar thermal collectors appear to be neighboring Canada and Mexico.

Lawrence Markel of Sentech, Inc., built upon Thompson’s message by highlighting several opportunities for renewable energy projects in developing countries in Central Asia, <http://www.ornl.gov/solarsummit/sentech.pdf>. Rural settlements and isolated areas that do not have access to pipelines, transmission lines, or even roads can apply solar technologies to power many aspects of their daily life, including irrigation systems, water purification systems, sheep shearing equipment, and lighting systems for houses, schools, and clinics. Markel stresses that the largest hurdle of initiating stable exporting to these regions is through pilot demonstrations that show a reduction in poverty and cost savings in other government expenditures. The U.S. Department of Commerce, the American Chamber of Commerce (AMCHAM), and the Eco-Energy Alliance are working together to increase these types of demos.

Brian O’Hanlon from the Department of Commerce closed the session with a brief overview of government programs that support U.S. exporters seeking trade and investment with other countries, <http://www.ornl.gov/solarsummit/DOC.pdf>. The Office of Energy & Environmental Industries, within the Department’s International Trade Administration (ITA), provides a wealth of resources to U.S. exporters that aim to increase competitiveness of U.S. businesses, eliminate foreign trade barriers and support trade promotion activities. Other units

of the ITA offer access to market research, feasibility studies, export “How to...” guidance and training for small businesses, risk insurance and loans, and more.

Southeast Solar Summit - October 24-25, 2007

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APPENDICES

Southeast Solar Summit - October 24-25, 2007

Appendix A: Southeast Solar Summit Program



SOUTHEAST
SOLAR SUMMIT

October 24-25, 2007

Oak Ridge National Laboratory

Conference Center



Dear Colleagues:

As co-hosts of the 1st Southeast Solar Summit, we are very pleased you could join us for this exciting inaugural event. We have exceeded our target of 150 participants and are very excited to host this event so that we may discuss new Solar opportunities together.

Worldwide interest in solar technology has never been higher. Solar technology offers a limitless supply of clean, safe, renewable energy for heat, light and power. We are at a time in history where we are struggling with climate change, limited grid infrastructure, and a major reliance on fossil fuels. The worldwide focus is turning toward the need to use cleaner sources of energy and to use that energy more efficiently. The Southeast Solar Summit will highlight the exciting research and development in solar technologies and the ongoing efforts in market transformation going on in the southeast. Together, these are positioning the southeast for a major role in the development and implementation of solar technologies.

In addition to a comprehensive technical program—tours, workshops, and a dedication ceremony have been planned to provide a broad range of experiences that will place the research, development, marketing, deployment, and policy issues associated with solar energy technology at your fingertips.

The success of this summit would not be possible without the excellent work of the organizing committee. We would like to offer special thanks to the following committee members:

Hilary Dixon, Southern Alliance for Clean Energy

Charlotte Franchuk, Data Support Services

Kimberly Grubb, Oak Ridge National Laboratory

Jeff Muhs, Oak Ridge National Laboratory

Tiffany Schneider, Berry College, Rome, Georgia

Haley Stone, University of Tennessee

Laura Wagner, Oak Ridge National Laboratory

We would like also like to thank ORNL's Creative Media Group for their excellent preparation of all the Summit materials. Finally, we want to recognize the efforts of the ORNL Facilities and Operations (F&O) Directorate, which has actively involved the ORNL research staff and our industry partners, to incorporate new technologies into the ORNL energy portfolio. The F&O Directorate has contributed heavily to the PV technologies that are visibly in place at ORNL today.

We look forward to personally meeting you during the next couple days.

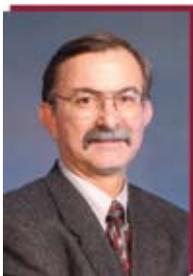


Melissa



Gil

***Welcome to Oak Ridge National Laboratory (ORNL),
Dr. Dana Christensen, Associate Laboratory Director, ORNL***



On June 5, 2006, Dana Christensen became Associate Laboratory Director of the Energy and Engineering Sciences Directorate of the Oak Ridge National Laboratory (ORNL). The Energy and Engineering Sciences Directorate is the U.S. Department of Energy's (DOE) largest energy laboratory executing over \$350M of programs for a variety of government and industrial sponsors in all dimensions of energy science and technology. Included are improvements in energy efficiency, renewable energy concepts, transportation, electricity distribution, fossil energy, hydrogen economy, fusion energy, nuclear technology and nuclear nonproliferation. Dr. Christensen came to ORNL from Los Alamos National Laboratory where he was the Principal Associate Laboratory Director for Threat Reduction. He has twenty nine years of management experience in material science, nuclear energy, fossil and renewable energy, nuclear materials management and scientific research in support of DOE and other government agencies.

***Welcome to Tennessee, Ryan Gooch, Director, Energy Policy, Tennessee
Department of Economic & Community Development***



As Director of Energy Policy, Ryan Gooch oversees the state's overall energy initiatives and develops and implements energy efficiency programs that focus on research development and job growth.

Prior to joining ECD, Gooch was a member of the senior management team at the Tennessee Department of Labor and Workforce Development, primarily focusing on planning and continuous improvement. While there, he facilitated the revision of the department's strategic planning process, assisted with the State Workforce Investment Act Plan and served as the TEMA Emergency Services Coordinator. In addition, Gooch has served four years on the board of examiners for the Tennessee Center for Performance Excellence (TNCPE). Gooch received his Bachelor of Arts degree in Economics and Spanish from Furman University in Greenville, SC.

***Craig Cornelius, Acting Program Manager, Solar Energy Technologies, Office
of Energy Efficiency and Renewable Energy, U.S. Department of Energy, The
Department of Energy's Solar America Initiative***



Craig Cornelius is the Acting Program Manager of the U.S. Department of Energy's Solar Program, with responsibility for direction and oversight of all program activities, including research & development, market transformation & technology deployment, policy formulation, and market outreach and inter-governmental cooperation. The program focuses on solar-to-electric technologies – including distributed and central station solar photovoltaics (PV) and solar thermal electrics (CSP) for utility-scale generation.

Cornelius received an A.B. cum laude from Princeton University, an M.A. in Science, Technology, and Public Policy from the George Washington University, and is a graduate of the Defense Systems Management College's Executive Program Management Course. He was a recipient of the NASA Space Grant Fellowship, and was a Henry Luce Foundation Scholar. In September 2007, Cornelius received the U.S. Department of Energy's Special Service Award for his work in creating the Solar America Initiative.

Plenary Speaker, Scott Hennessey, Manager of Policy and Research, Solar Energy Industries Association (SEIA)



Scott is responsible for coordinating market and industry data for use by both the Government Affairs and Public Affairs divisions. He also helps draft policy positions, research documents and informational materials. Previously, he was the Special Assistant to the Chairman of The Brattle Group, an economic and environmental consulting firm. His background includes experience in civil litigation, social justice, and environmental policy. He received his J.D. from Boston College Law School and a B.A. in Politics from Oberlin College. Scott is a Member of the Bar Associations for the Commonwealth of Massachusetts and the District of Columbia.

Trends in Public Opinion for Solar Technologies, Suzanne Shelton, President and CEO, The Shelton Group



Suzanne Shelton is president and CEO of the Shelton Group, a marketing and advertising agency specializing in taking energy efficiency-related products and services to market. Shelton conducts an annual nationwide study called Energy Pulse, which explores consumer attitudes towards conservation, energy-efficiency and energy-efficient products and homes. It also profiles U.S. households by their perceptions of the importance of conservation and energy efficiency, their current conservation activities, awareness of energy-efficient building, perceived price points and purchase potential of energy-efficient homes, home features and applications.

Shelton Group's client list includes the American Institute of Architects, BP Solar, Cleveland Public Power, Knauf Insulation and Vectren Energy. Her firm's mission is to grow its clients businesses, which they do through research-driven market planning and targeted creative work. Suzanne speaks to groups across the country about how to effectively implement strategic marketing, brand strategy, and advertising, marketing and public relations campaigns.

Lunch—Keynote Address, Steve Coonen, Vice President, Business Development, Open Energy Corporation



Steve Coonen has been working in the photovoltaics field since 1983 first as an electrical contractor then Mr. Coonen began specializing in new construction photovoltaic applications with Photocomm (now Kyocera Solar). Since 1994 with his hire by Atlantis Energy AG of Switzerland, Mr. Coonen has focused on Building Integrated Photovoltaics. For the past 13 years he has had a sole focus on creating PV building materials, for both the glass and roofing industries. Mr. Coonen currently is employed by Open Energy as VP of Product Development and has over 2,000 PV systems designed and installed.

Lunch—Keynote Address, Jeff D. Muhs, Director, Strategic Planning, Engineering Science and Technology Division, Oak Ridge National Laboratory



Jeff Muhs received an A.S. in Laser Electro-Optic Technology from Vincennes University (IN) in 1984 and a B.S. in Electro-Optical Sciences from the University of Houston-Clear Lake (TX) in 1986. During his first 10 years at ORNL, Jeff developed several fiber optic sensors and electro-optic components used in the transportation, energy, health-care, and national security business sectors. For his pioneering work and innovation in fiber optic sensors, Jeff was named ORNL's "Engineer/Scientist of the Year" in 1997. Then Jeff focused his professional career on developing a new interdisciplinary technology called hybrid solar lighting—a novel method of reducing electricity use and improving lighting quality in commercial buildings. In addition to being the technologies principal inventor, Mr. Muhs organized a research consortium of 20 public and private entities including Fortune 500 companies, utilities, and several prominent universities. Jeff has authored 12 patents along with several dozen technical publications and magazine articles. His work has been featured in several prominent scientific periodicals and on national and international television networks. In 2004, Jeff was named ORNL's "Science Communicator of the Year." In 2005, Jeff was selected as a Legislative Fellow and advisor for U.S. Senator Lamar Alexander on science, technology, and energy issues. He developed numerous provisions in the Energy Policy Act of 2005, and under the Senator's direction, led initial efforts on what was announced by President Bush in the 2006 State-of-the-Union Address as the American Competitiveness Initiative. Jeff rejoined ORNL in 2006 where he is now the Director of Strategic Planning for the Engineering Science and Technology Division and Group Leader of Photonics R&D.

Dinner—Keynote Address, Integration of Solar Electric Power—A National Review, Mike Taylor, Technical Services Manager, Solar Electric Power Association (SEPA)



Mike Taylor is the Technical Services Manager for the Solar Electric Power Association (SEPA), a non-profit association in Washington D.C. that provides technical outreach to electric utilities nationwide. Mike is responsible for developing solar program and research services to electric utility members, including active projects on utility solar business models, photovoltaic capacity statistical valuation, decoupling, a national solar incentive participant survey, and a national utility metering and interconnection survey.

Prior to joining SEPA in 2006, Mike spent seven years with the Minnesota Department of Commerce in the State Energy Office specializing in renewable energy policy and program development, including the areas of wind, solar, biomass, biofuels, conservation, and climate change. While in Minnesota, he received a competitive grant for \$1.2 million to design and operate the Minnesota Solar Electric Rebate program, a statewide incentive program, which has since received additional funding from the Minnesota legislature. Mike received his MS in Science, Technology, and Environmental Policy from the University of Minnesota, writing his Master's thesis on the statistical relationship between photovoltaic production and electric utility demand, and his BA in Environmental Biology from Saint Mary's University of Minnesota.

Wednesday, October 24, 2007

Focus -- Research and Development and Market Transformation

Purpose: To focus on new opportunities to promote solar research and development (R&D) and market transformation in the Southeast. The 1st Southeast Solar Summit will facilitate strategic partnerships of established organizations in the region that understand the energy needs, economics, and market of our demographic. A technical report will be prepared as an outcome of the Summit.

- 7:45am Registration—Continental Breakfast – Networking Opportunity
- 8:15am Welcome to Oak Ridge National Laboratory (ORNL), **Dr. Dana Christensen**, Associate Laboratory Director, Energy and Engineering Sciences, ORNL
- 8:30am Welcome to Tennessee, **Ryan Gooch**, Director, Energy Policy, Tennessee Department of Economic & Community Development
- 8:45am Opening Plenary, **Craig Cornelius**, Acting Program Manager, Solar Energy Technologies, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy
- 9:10am U.S. Solar Market, **Scott Hennessey**, Solar Energy Industries Association (SEIA), Manager of Policy and Research
- 9:35am Trends in Public Opinion for Solar Technologies, **Suzanne Shelton**, President and CEO, The Shelton Group
- 10:00am **Break—Walk to Photovoltaic System Dedication Ceremony**
- 10:10am Dedication Ceremony of the New Photovoltaic System Installation at ORNL
- 10:50am **Break—Walk back to Conference Center**

Wednesday, October 24, 2007

Research and Development (R&D) Facilitated Discussions Technical Track 1

- 11:00am **Chair: Curt Maxey**, ORNL
Moderator, **Dr. Craig Blue**, Deputy Director for Technology, Materials Science and Technology Division, ORNL
Session 1: Photovoltaics (PV), Facilitators, **Dr. Ron Ott**, ORNL and **Dr. ViJay Yelundur**, University Center of Excellence for Photovoltaics, Georgia Institute of Technology—Presentation
Group Discussion
- 12 noon Working Lunch—Keynote Address—Buildings Integrated Photovoltaics (BIPV), **Steve Coonen**, Vice President, Business Development, Open Energy Corporation
- 1:00pm R&D Facilitated Discussions
Session 2: Buildings Integrated Photovoltaics (BIPV), Facilitators—**Steve Coonen**, Vice President, Business Development, Open Energy Corporation and **Dr. Lew Fraas**, President, JX Crystals, Inc.—Presentation
Group Discussion
- 1:45pm R&D Facilitated Discussions
Session 3: Concentrator Photovoltaics (CPV), Facilitator—**Dr. Lew Fraas**, President, JX Crystals, Inc.—Presentation, **Bob Conner**, Semprius—Presentation and **Rik Hurt**, University of Nevada Las Vegas—Presentation
Group Discussion
- 3:00pm **Break—Networking Opportunity**
- 3:15pm R&D Facilitated Discussions
Session 4: Buildings and Grid Integration, Facilitators, **Burak Ozpineci** (ORNL) and **Tom Jahns** (University of Wisconsin)—Presentation
Group Discussion
- 4:15pm **Session 5:** Solar Research Needs for Utilization Beyond Conversion, Facilitator, **Jeff Muhs**, Director, Strategic Planning, Engineering Science and Technology Division, ORNL
Group Discussion
- 5:45pm R&D Track Wrap-Up
- 6:00pm Reception (Tour option: CATS Facility)
- 6:30pm Dinner—Keynote Address, Integration of Solar Electric Power—A National Review, **Mike Taylor**, Technical Services Manager, Solar Electric Power Association (SEPA)

Wednesday, October 24, 2007

Market Transformation (MT) Economic Development Track 2

- 11:00am **Chair: Gil Melear-Hough**, Southern Alliance for Clean Energy (SACE)
Moderator: **Kevin Lynn**, Sentech, Inc./U.S. Department of Energy
Solar Energy Technologies Program
Overview – will consist of targeted sessions focusing on market transformation needs for solar and other renewables specific to the Southeast
Justifying the Cost of Solar, **Dr. Ross McCluney**, Florida Solar Energy Center (FSEC)
Installer Certification and Training, **Allan Gentry**, Cleveland State Community College
Question and Answer Session
- 12 noon Working Lunch—Keynote Address—Buildings Integrated Photovoltaics (BIPV), **Steve Coonen**, Vice President, Business Development, Open Energy Corporation
- 1:00pm Speaker & Breakout Facilitator Market Transformation Success Stories & Lessons Learned. Each panelist to provide overview of successful approaches and future opportunities for growth
John Morris, President & CEO, Sunlight Direct, Inc.
Thomas Tripp, Big Frog Mountain, Recognizing the Value of Solar
Jeff Curry, Alternative Energy Coordinator, Lakeland Electric
Question and Answer Session
- 2:00pm Combining Energy Efficiency and Solar on New Home Construction, **Beth Eason**, Leadership in Energy and Environmental Design (LEED)
- 2:30pm National and State Incentives, **Steve Kalland**, Director, North Carolina Solar Center (NCSC)
- 3:15pm Renewable portfolio standards and how upcoming and new federal and state legislation will affect the solar markets in the Southeast, **Stephen Smith**, Southern Alliance for Clean Energy (SACE)
- 3:45pm Solar America Initiative—Market Transformations, **Kevin Lynn**, Sentech, Inc./U.S. Department of Energy Solar Energy Technologies Program
Questions and Answers
- 4:15pm Brainstorming session to begin coordinating the regional plan for solar and renewable energy market transformation
Facilitator: **Scott Hennessey**, SEIA Manager of Policy and Research
- 4:45pm The Role of Utilities Renewable Energy Green Power Programs, **Edward Colston**, Tennessee Valley Authority

- 5:15pm The Role of Non-profits in Market Transformation, **Alex Tapia**, Kilowatt Ours
- 5:45pm MT Track Wrap-Up
- 6:00pm Reception (Tour option: CATS Facility)
- 6:30pm Dinner—Keynote Address, Integration of Solar Electric Power—A National Review, **Mike Taylor**, Technical Services Manager, Solar Electric Power Association (SEPA)

Thursday, October 25, 2007 _____
Focus -- Zero Energy Homes (ZEH) and Clean Energy Technology (CET)
Industry Developments and Field Trips

- 8:00am Registration – Continental Breakfast (Tour option: CPV system)
- 8:30 - 10:15am Building Solar into the Southeast, Facilitator—**Dr. Robert Shelton**, Sr. Associate for Energy Policy, Howard Baker Center for Public Policy, the University of Tennessee
- 8:30am Tennessee Perspective on Solar Incentives and Outreach, **Brian Hensley** and **Clinton Berry**, Tennessee Economic & Community Development, Energy Policy
- 9:00am Building Solar into Commercial Buildings, **Herb Stonebrook**, Energy Management Administrator, Tennessee Department of Finance and Administration
- 9:15am Residential Zero Energy Construction, **Jeff Christian**, Director, Buildings Technology Center, ORNL
- 9:45am Walden Reserve Community Development, **Paul Radtke**, Director of Community Relations, Walden Reserve, LLC and **Patrick Hughes**, Building Technologies Integration Manager, ORNL
- 10:15am **Break—Networking Opportunity**
- 10:30am **Track 1 Finalize R&D Summary of Outcomes/Action Items (Chair: Curt Maxey)**
Track 2 Finalize MT Summary of Outcomes/Action Items (Chair: Gil Melear-Hough)
- 11:15am Summary of Outcomes to Participants
- 11:30am Working Lunch—Keynote Address—Towards a Transformational Solar Energy R&D Portfolio, **Jeff Muhs**, Director, Strategic Planning, Engineering Science and Technology Division, ORNL

12:30pm Industry Roundtable – Renewables and Success Stories, Facilitator, **Tom Ballard**, Interim Director, Technology Transfer and Economic Development (TTED), ORNL

Steve Johnson, LightWave Solar Electric

Mel Jones, President and CEO, Sterling Planet

1:30pm Moderator: **Kay Thompson**, Office of Policy and International Affairs, U.S. Department of Energy, “Is the Next Step Exporting?”

Lawrence Markel, Sentech, Inc.

Brian O’Hanlon, International Trade Specialist, Office of Energy and Environmental Industries, U.S. Department of Commerce

2:30-5:00pm

Optional Tours:

*Tour of Near-Zero Energy Homes (41 cents per day) at the Habitat for Humanity subdivision in Lenoir City, Tennessee, led by **Jeff Christian** (ORNL).*



*Tour of Buffalo Mountain Wind Farm – Comprised of 15 1.8MW Vestas V80 turbines atop Windrock near the town of Oliver Springs, Tennessee, led by **Rick Carson** (TVA).*

*Tour of Spallation Neutron Source (SNS) – an accelerator-based neutron source built in Oak Ridge, Tennessee, by the Department of Energy (DOE), led by **Al Ekkebus**.*



5:00pm Bus departs ORNL to Hotels

Exhibitor List

1. **Advanced Energy, Inc.**, Fort Collins, CO

Advanced Energy® is a global leader in innovative power and control technologies for high-growth, thin-film manufacturing and solar power generation. Specifically, AE targets semiconductors, solar cells, flat panel displays, data storage products, architectural glass, solar grid-tie inverters, and other advanced product applications.

<http://www.advanced-energy.com/en/About.html>

2. US Department of Energy **Building America Program – Solar Best Practices**, Oak Ridge, TN

Building America's research on the integration of residential renewable and other on-site power system focuses on identification of system engineering issues that must be resolved before the long term goal of large numbers of cost effective, marketable, zero net energy homes (ZEH) can be achieved.

Research into systems integration of renewable and other on-site power systems such as solar, includes evaluation of cost tradeoffs between investments in energy efficiency and on-site power systems, along with evaluation of net daily, monthly and annual energy contributions from such systems. Another important research area is Building America's monitoring and analysis of data from the growing numbers of homes at the upper end of the home market that are being constructed utilizing solar technologies as options to reduce some of their energy costs.

http://www.eere.energy.gov/buildings/building_america/

3. **Energy Efficiency and Renewable Energy Program**, Oak Ridge, TN

ORNL's Energy Efficiency and Renewable Energy (EERE) Program develops sustainable energy technologies to create a cleaner environment, a stronger economy, and a more secure future for our nation. The Program is committed to expanding energy resource options and to improving efficiency in every element of energy production and use.

<http://www.ornl.gov/eere/>

4. **Menova Energy, Inc.**, Ontario, Canada

Menova Energy provides affordable solar energy solutions for industrial, commercial, and institutional applications. The Power-Spar is a Menova's high efficiency solar concentrator that provides heat, hot water and electrical power. The Power-Spar is a Concentrated Photovoltaic Thermal (CPVT) system specifically engineered to provide unprecedented thermal performance in harsh climates. The patented absorber design results in high operating efficiencies in both cold and hot environments.

www.power-spar.com

5. **OneWorld Sustainable**, Athens, GA

OneWorld Sustainable offers a diverse selection of products and services including solar, wind, and micro-hydro energy generation systems as well as energy efficiency audits and green building renovation for homes, businesses, and institutions. OneWorld is responsible for the development of the George Solar Schools Program – an initiative designed to encourage student interest in environmental and social sustainability issues. Our international initiative includes a variety of projects in Kenya, Sudan, Uganda, and Tanzania.

<http://www.oneworldsec.com>

6. **ORNL, Engineering Science and Technology Division (ESTD)**, Oak Ridge, TN

ESTD is one of the largest research and development divisions at ORNL and performs research for the Department of Energy and other agencies and organizations in the fields of energy research, robotics, sensors, electronics and transportation.

www.ornl.gov/estd

7. **Pursuit of the Affordable Zero Energy Home (ZEH in East Tennessee),**
Lenoir City, TN

This exhibit showcases the 5 test houses with total energy costs as low as a daily average of \$0.42, compared to typical new construction of about \$4/day. You will be offered an opportunity to pick out either a one-story or two-story ZEH, if you are ready to build. Please come to this poster with your current average daily cost for energy to run your entire home. Add up the last 12 months of utility bills (gas, electricity, fire wood and propane) and divide by 365.

http://www.ornl.gov/info/ornlreview/v40_2_07/2006-04_tva_factsheet.pdf

8. **Solar Labs,** Knoxville, TN

Solar Labs unique rooftop air heating system traps full spectrum sunlight at over 80% efficiency. Converted heat is fan-forced downward at high velocity to offset building energy requirements and reduce carbon dioxide emissions. The self-contained panels do not require a separate duct system, which simplifies installation and enables zone heating. Due to their high efficiency and economy, Solar Labs direct air-heating systems promise the equivalent of “grid parity” in natural gas savings for commercial buildings.

www.power-spar.com

9. **Southeast Solar Company,** Duluth, GA

Southeast Solar Company is the Regional distributor of Apricus solar products for the Southeastern USA. We are located in Duluth GA. This product is for solar thermal applications such as heating water, pool heating, heating commercial buildings and home heating by hydronic heating system. Works are underway to incorporate solar cooling applications. Apricus was nominated as one of the Top 10 Green Building products for 2007 by the Sustainable Living Magazine. This evacuated tube technology has a reputation for its high temperature applications and being trouble and maintenance free. Apricus is extremely popular and widely used in Europe, South East Asia, Australia and West coast of USA. They are certified by SRCC, SAI Global and SPF.

www.southeastsolar.net

10. **Tennessee Department of Economic & Community Development,**
Nashville, TN

The Tennessee Department of Economic & Community Development is developing the infrastructure and resources of Tennessee communities and harnessing a business friendly atmosphere while attracting new industries and assisting existing industries expand.

<http://www.state.tn.us/ecd/index.htm>

11. **Tetra Tech, Inc.,** Oak Ridge, TN

TetraTech, Inc. (Tt) is an industry leader in infrastructure systems integration, environmental engineering, energy generation, and sustainable resource utilization. Tt core competency is providing complete life-cycle solutions from engineering through permitting, construction, operation, and decommissioning. Tt, founded in 1968 and headquartered in Pasadena, California, has approximately 8000 employees worldwide.

<http://www.tetrattech.com>

12. **Zayas Energy,** Newberry, FL

Zayas Energy has a diverse array of alternative energy solutions. These include solar and wind power generation, solar lighting, solar air conditioning and solar water heating for home, business and pool.

<http://zayasenergy.com>

**Dedication Ceremony for new
Photovoltaic System at ORNL
October 24, 2007
10:00 – 10:45 a.m.
ORNL, next to Visitors Center
www.ornl.gov/solarsummit**

- 10:00am Summit Attendees Break / Walk to Ceremony
- Welcome** 10:10am Master of Ceremony (MC): **Bob Hawsey**,
ORNL EERE Director
- Remarks** 10:15am **Dr. Thomas Mason**, ORNL Laboratory Director
- 10:20am **Anda Ray**, TVA Vice President of Environmental
Stewardship and Policy
- 10:25am **Craig Cornelius**, Acting Program Manager,
Solar Energy Technologies, U.S. Department
of Energy, Office of Energy Efficiency and
Renewable Energy
- Dedication** 10:35am **Dr. Thomas Mason, Craig Cornelius, Ryan Gooch**
(Director of Energy Policy, Tennessee Department
of Economic and Community Development),
Anda Ray, and **Stephen Smith** (Director, Southern
Alliance for Clean Energy)
- Closing** 10:40am **Bob Hawsey**
- 10:45am -Media event
-Attendees return to Summit for 11:00 a.m. session



Contact: **John Morris**, President, Sunlight Direct, Inc.

**Hybrid Solar Lighting Workshop
at the Southeast Solar Summit**

Friday, October 26, 2007
8:30am - 12noon

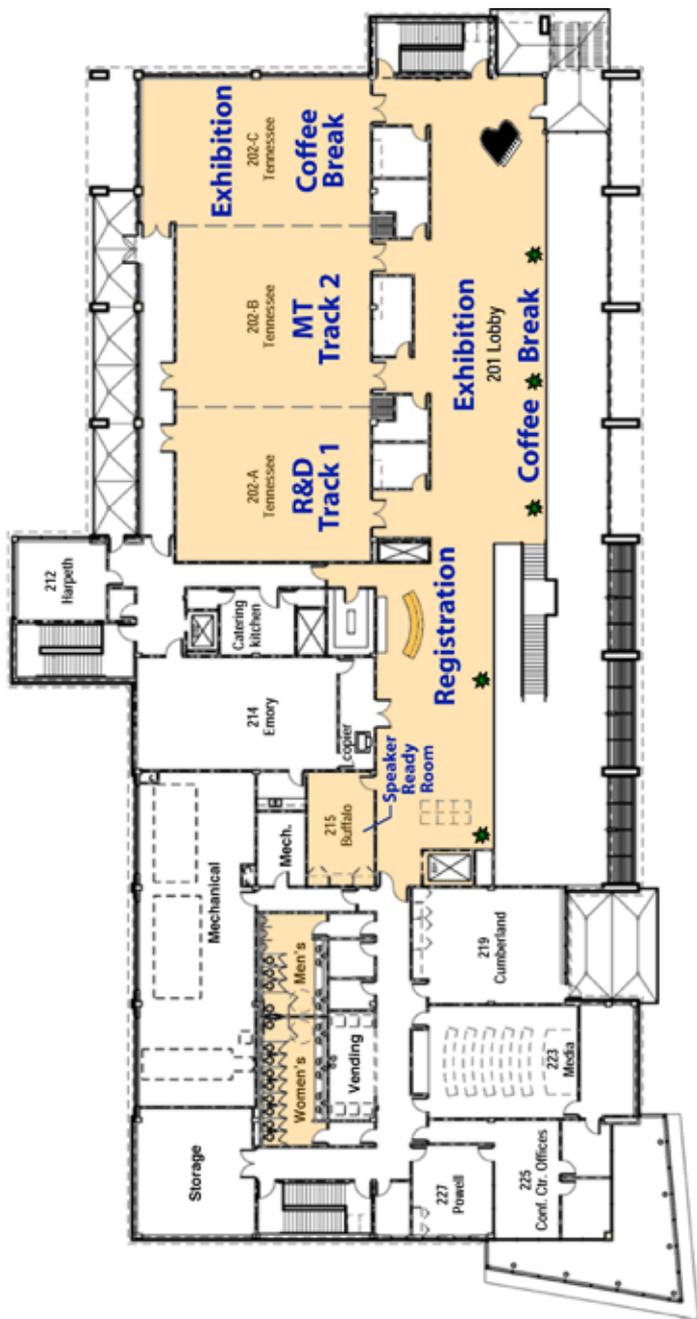
Friday, October 26, 2007
10:00am Networking Break

Hybrid Solar Lighting Laboratory Tour



**Solar Air Heating For
Commercial Buildings
at the Southeast Solar Summit**

Friday, October 26, 2007
10:30am-12:30pm



Building 5200
(Second Floor)



Southern Alliance for
Clean Energy



Appendix B: Southeast Solar Summit List of Participants

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Southeast Solar Summit - October 24-25, 2007

Appendix C: Southeast Solar Summit List of Exhibitors

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Building America – Solar Best Practices

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Integrity Windows

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Marvin Concepts

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Menova Energy, Inc.

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One World Sustainable

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Oak Ridge National Laboratory-
Pursuit of the
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(ZEH in East TN)

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Solar Powered Volcano
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Appendix D: Southeast Solar Summit Sponsors



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Appendix E: Southeast Solar Summit Press Coverage

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5. Mansfield, Duncan. “Solar energy push will have to convince consumers.” WKRN (TV), October 25, 2007 <http://www.wkrn.com/nashville/news/ap-solar-energy-push-will-have-to-convince-consumers/125349.htm>
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Fig. D-1: Dana Christensen describes the importance of solar technology.

