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SED

Solar Energy Division Newsletter

Carl Bingham and James E. Pacheco, Editors *Summer 2002*

State of the SED

The Solar Energy Division (SED) holds a somewhat unique position in ASME. Despite the relatively small fraction of mechanical engineering jobs in this country directly related to solar energy, the division membership, when we include all those who list solar as one of their interest groups, continues to hold nearly constant at more than 6,000 members. To me, this is a reflection of the perceived importance of renewable energy in this country. Many of us work in totally unrelated areas, yet volunteer our time to the SED because we understand the critical role that clean and renewable energy sources must play in the future of this and other nations.

This year we have worked to strengthen the SED by identifying these specific objectives

- Assist with improvement in JSEE,
- Continue support of the Solar Splash competition,
- Strengthen Technical Committees, and
- Improve attendance at conferences.

JSEE — The *Journal of Solar Energy Engineering* is the technical forum for archival publications for the SED. The editor, Dr. Jane Davidson, has done an absolutely wonderful job of revitalizing and modernizing the journal. With the support of the SED and her editorial staff, she has added several "international" associate editors, implemented "special issues" with papers related to specific areas, and instituted "discussion" and "solar scenery" sections in each issue. For the first time in many years, the journal has had to request additional page allocations to ensure timely publication of papers.

Solar Splash — The Solar Splash is a solar powered boat competition sponsored in part by the SED, put on by Advanced Energy Competitions, and organized by George Ettenheim. The "splash" is a wonderful opportunity for colleges and some high schools to participate in a challenging multi-objective design experience. For the past several years, approximately 20 schools from across the US have participated each year, with additional participation from Canada, Puerto Rico, and Japan. The SED is proud to support, both financially and with volunteers, this ongoing event (see articles in this issue).

Technical Committees — The technical committee (TC) is the heart and soul of ASME technical programs. Each TC is responsible for organizing and running sessions at technical meetings. TC activities include soliciting and reviewing papers and organizing and moderating panel sessions. The TC chairs also share in the governance of the SED through participation on the executive committee. Although we added several new TC chairs this year, we are always looking for new faces to join in the operations of the SED. Anyone who is interested in becoming an active participant in the SED is encouraged to contact any of the TC chairs or other officers of the SED.

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ASME *Journal of Solar Energy Engineering*

Jane Davidson, Editor
Stephanie Clark, Editorial Assistant
Donna Thompson, Production Editor, ASME

Dear Fellow Solar Division Members and Friends,

The ASME *Journal of Solar Energy Engineering* publishes Technical Papers of permanent interest in all areas of renewable energy and energy conservation as well as Discussions of policy and regulatory issues that affect renewable energy technologies and their implementation. Papers that do not include original work but nonetheless present quality analysis or incremental improvements to past work may be published as Technical Briefs. Solar Scenery features photographs or graphical displays.

The Editorial Board includes thirteen Associate Editors who are responsible for topical areas in building and energy conservation, solar collectors, solar thermal power, solar space applications, solar ponds, solar chemistry and bioconversion, energy storage, testing and measurement, fundamentals and theory, system and component simulation, photovoltaics, wind energy, and conservation and solar buildings. The *Journal* welcomes papers that introduce new fields

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Solar Splash – The Old and the New

The only thing old about the 2001 Solar Splash was the fantastic setting of Delaware Park in Buffalo, NY. The competition took place at Hoyt Lake, which is also the site for the Art Museum and the Historical Society. The Splash was the centerpiece of the centennial celebration of the 1901 Pan-American Exposition that literally took place in Delaware Park. The Exposition featured the use of outdoor electricity, so, 100 years later the uses of natures potential were still on display.

Shortly before the 2001 Event was held, Headquarters was contacted by a large utility in Arizona about the possibility of starting a High School level program. By mid-summer, the SRP Solar Splash was in full swing. The federal government created the Salt River Project to control and utilize water before Arizona became a state. Today, it provides water and power to one of the fastest growing states in the union.

Through the efforts of the Solar Energy Division from the inception of Solar Splash and with financial support in recent years from the Petroleum Division, the World Championship has served as a stimulus/model for this new event.

There are now 15 Arizona High Schools building solar/electric boats. These students have attended a one day Technical Workshop and 90 of them, with their faculty advisors, assembled a standard hull on October 20th in Tempe. The Event will be held on Tempe Town Lake, March 20-23, 2002.

The turnout in Buffalo was really tremendous, thanks to a huge amount of work on the local level. When the volunteer list hit 100, it was necessary to stop taking names, but that didn't prevent many interested residents from attending. The Splash was covered very well by the local media and even appeared on CNN. Many local government people participated in opening and closing ceremonies and invited us back for 2002. The site is excellent, as can be seen in the photos, and the location is very convenient for the teams. One of the California teams made no secret of the fact that "if it were closer to home, we probably wouldn't have such good attendance".

Although it was close, the ***University of South Carolina*** repeated their win from 2000. Second place went to ***Marquette University*** who nosed out the ***US Coast Guard Academy*** by only .06 points out of a possible 1000. ***Rice University*** in their first year came in fourth, followed by the ***University of Arkansas,*** only 7 points behind.

The premiere event is the 2-hour Solar Endurance, which was won by ***Marquette*** who covered 36.6 kms in the two, 2-hour heats. Second was ***Rice*** and third was ***South Carolina. SUNY- Stony Brook*** was the fastest qualifier and the Best Technical Report was submitted by the ***College of New Jersey. Kansas State University in Salina*** won the Outstanding Solar System Design award.

A total of 16 teams participated, two from California, one from Canada, one from Buffalo and the remainder from various parts of the country. For 2002, there are 20 entries to date including quite a few new schools. Solar Splash continues to attract many mechanical and electrical engineering students each year.

Each heat of the Solar Endurance begins with a Parade lap in front of the Historical Society Building, the only structure remaining from the Pan-American Exposition of 1901. The field is divided in half and two heats are run in the morning and two in the afternoon.

The Splash attracted many visitors. Some came intentionally, while others came upon it while out biking or running through the park. The Event attracted so many visitors that the local ice cream vendor sold out.

Normally, boating isn't allowed on the lake so we purchased these docks for launching and retrieving the Solar Splash boats. Batteries and Solar Panels are typically added after the boat is in the water. The concrete decking afforded each team adequate space at water's edge.

Just before the green flag drops to start a heat of the Sprint, the "High-Line" is raised. This procedure assures that all competitors are lined up properly for the start. Since the Sprint is only 300 meters, solar panels are not used because it only takes 10's of seconds for the teams to negotiate the course.

Division Leadership Opportunities

There are currently ten technical committees in the SED. The chairs of the technical committees (TCC's) provide the leadership for their technical group and represent the interests of their technical area on the executive committee. TCC's are elected to three-year terms, so each year the division needs three or four volunteers to fill the expired terms. The SED is currently looking for chairs for the technical committees on: **1) Testing and Measurements, 2) Heating and Cooling Applications and Analysis, 3) Solar Space Applications,** and **4) Fundamentals and Theory.**

If you think you might be interested in serving your division as a TCC, please contact any of the Executive Committee members listed at the end of this newsletter. Also, details of the duties and responsibilities of the TCC's can be found in the SED Operations Manual available at http://www.asme.org/divisions/solar/opguides.html.

Accredited PV Testing and Training at FSEC

Over the past six months, the Florida Solar Energy Center (FSEC) has received numerous accreditations that will allow it to better serve the photovoltaic community. These include accreditation for both laboratory testing and professional training, making it the only facility in the United States to be accredited for both.

In 1976 the Florida legislature mandated FSEC to test and certify all solar equipment manufactured or sold in the State. After several years of preparation, FSEC applied to the American Association for Laboratory Accreditation to receive accreditation from the International Standards Organization (ISO). FSEC passed ISO/IEC 17025 standards (1999 "General Requirements for the Competence of Testing and Calibration Laboratories") as a quality laboratory for testing solar thermal and PV hardware in August 2001.

The laboratory accreditation permits FSEC to act as a quality laboratory for testing and certifying photovoltaic modules, testing and certifying stand-alone photovoltaic systems and certifying grid-tied photovoltaic systems. FSEC becomes the first U.S. laboratory approved to offer stand-alone and grid-tied photovoltaic system certification.

Soon thereafter, FSEC applied for a photovoltaic-specific accreditation from the PowerMark Corporation. Full PowerMark accreditation allows a facility to certify PV modules, grid-tied PV systems, and stand-alone PV systems. PowerMark Corporation is the sole U.S. agent for the Photovoltaic Global Approval Program (PV-GAP) and the only U.S. photovoltaic testing and certification program meeting the requirements for international reciprocity. PMC's certification program is based on both U.S. and international standards.

The recommendation for FSEC accreditation came from the PowerMark Corporation (PMC) Accreditation Committee following their formal audit of FSEC in December 2001. Until then, Arizona State University has stood alone as the only laboratory accredited by PowerMark to test and certify PV modules.

FSEC's accreditation also includes system certification. These ratings will help improve system designs and provide consumers with realistic expectations of energy production. They will also be used in determining rebates for grid-tied system installations.

The testing of stand-alone photovoltaic systems will help improve their performance and reliability and will help the U.S. industry compete in the international marketplace. Certification tests will be used for both performance evaluation and design verification.

Grid-connected system designs must use photovoltaic modules that have been tested and certified. In addition, the designs must be properly documented and reviewed for compliance with the National Electrical Code, IEEE and UL standards and use of accepted design practices.

FSEC Practitioner Training Program Accreditation

The Institute for Sustainable Power (ISP) is a national organization that gives accreditation to individuals and organizations that provide photovoltaic training. There are three accreditation categories: training institutions, master trainers, and continuing education programs. In July 2001, the Florida Solar Energy Center was awarded the first accreditation for a training facility, and the first master trainer – Mr. Jim Dunlop. FSEC has been offering PV installation and design courses for 15 years, and has had a surge in course attendance over the last two years.

Auditing for training accreditation includes evaluation in staff qualifications, facility qualifications, organizational quality, hardware resources, and available library resources.

Practitioner certification is a credential awarded to the practitioner indicating that minimum competency standards have been met. Meeting minimum competency standards requires assessments of knowledge, skill and experience. Certification is voluntary, but may be "required to do business." For example, the Florida PV Buildings Rebate program required that such certification be obtained by installers prior to applying for the State's buy-down funding.

Given a grid-connected PV system design, including major components, drawings and instructions, the PV practitioner will install a grid-connected PV system that meets the needs of the customer, the site, and local code requirements by:

1. Working safely with photovoltaic systems
2. Conducting a site assessment
3. Selecting a system design
4. Adapting the mechanical design
5. Adapting the electrical design
6. Installing subsystems and components at the site

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Best Papers Solar Energy Division Forum 2001

Solar Thermal Technical Committee

Reiner Buck, Thomas Bräuning, Thorsten Denk, Markus Pfänder, Peter Schwarzbözl, Felix Tellez, "Solar-Hybrid Gas Turbine-Based Power Tower Systems (REFOS)"

Photovoltaics Technical Committee

A.H. Fanney, B.P. Dougherty, M.W. Davis, "Measured Performance of Building Integrated Photovoltaic Panels"

Heating and Cooling Applications and Analysis Technical Committee

S. Arora, J. Davidson, S. Mantell, J. Burch, "The Thermal Penalty of an Immersed Heat Exchanger in Integral Collector Storage System"

Conservation and Solar Buildings Technical Committee

M.P. Deru, A.T. Kirkpatrick, "Ground-Coupled Heat and Moisture Transfer from Buildings: Part 1 - Analysis and Modeling"

Accredited PV Testing and Training at FSEC

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7. Performing a system checkout and inspection
8. Maintaining and troubleshooting a system

In the future, other organizations such as community colleges and vocational-technical institutions will be accredited. It is anticipated that PV installation, design, and code compliance training will be increasingly available through apprenticeship programs, degree programs, certificate programs, training organizations, electrical NJATC and similar trade groups, renewable energy and industry associations (national, regional, state), research and education institutions, and other organizations specializing in energy training.

The Florida Solar Energy Center, a research institute of the University of Central Florida, is the largest and most active state-supported energy research center in the country. Current research activities include photovoltaics, distributed generation, solar water heating and pool heating, energy-efficient buildings, alternative transportation systems, hydrogen fuel, and other energy areas. For more information, call the FSEC Public Information Office at 321-638-1015 or go to www.fsec.ucf.edu.

Graduate Student Awards

The SED Graduate Student Award for 2001 went to Mr. James McLeskey, Jr. of the University of Virginia, while Ms. Wei Liu of the University of Minnesota received the Runner-up award. Both recipients were invited to present their graduate research work at the 2001 SED conference. Mr. McLesky presented a paper titled "Femtosecond Energy Diffusion Studies of Amorphous Silicon Solar Cells", and Ms. Liu presented her work in a paper titled "Natural Convection Heat Transfer in a New Polymer Solar Water Heating System".

2001 marked the second year for the Division's Graduate Student Award. The winners of the 2000 inaugural year awards were winner Gary Rosengarten of the University of New South Wales and runner-up Joshua Plaisted of the University of Wisconsin.

The third annual award will be presented at the 2002 International Solar Energy Conference. The deadline for applying for the 2002 award has passed, but interested students should consider applying for the 2003 award. The SED Graduate Student Award recognizes outstanding research performed by graduate students in one of the several areas supported by the Solar Energy Division. The winner receives a $1000 cash award, a recognition plaque, and complementary registration at the International Solar Energy Conference. The deadline for applications for the 2003 award is December 15, 2002. Please visit the Division's web site www.asme.org/divisions/solar/ for complete details about eligible research areas and application information.

Upcoming Events

The SED will continue to sponsor the Graduate Student Competition and the Solar Splash events described in more detail in other sections of this newsletter. These, along with conference planning schedule represent the SED major events for the coming months.

The SED has traditionally participated in two conferences a year with one being in the spring (often with the American Solar Energy Society) and the other being the ASME IMECE in November. In an attempt to better serve a broader spectrum of its membership, the proposed SED conference schedule for the next four years will depart somewhat from this tradition. Note that this schedule is for planning purposes and is subject to change.

Conferences

— 2002—

Solar 2002, Reno Nevada, June 15–20, 2002

IMECE 2002, New Orleans Louisiana, November 17–22, 2002

— 2003—

ISEC 2003, Hawaii, March, 2003

IECEC 2003 (SED participating, AIAA hosting), Washington DC or San Diego California, August 2003

— 2004—

AIAA Wind Energy Conference, Reno Nevada, February 2004

IECEC 2004, August 2004

— 2005—

AIAA Wind Energy Conference, Reno Nevada, February 2005

ISES/Solar 2005, Orlando Florida, August 8-12, 2005

Congratulations to New Fellows

Four members of the Solar Energy Division were awarded the Fellow Grade by ASME. Jeff Morehouse, David Claridge , Allan Kirkpatrick, and Bill Worek were recently bestowed this honor. The Fellow Grade is the highest elected grade of membership within ASME, the attainment of which recognizes exceptional engineering achievements and contributions to the engineering profession.

Jeffrey H. Morehouse is a Registered Professional Engineer with experience including production engineering at IBM, instructing at Naval Nuclear Power School, managing a division of SAIC, and teaching at Texas A&M and the University of South Carolina. His research and development activities have primarily involved thermal and economic performance analyses of various innovative energy systems, using computer modeling and simulation. Dr. Morehouse has also been active in engineering education through the development of 'vehicle-based' hands-on courses, labs, projects, and extracurricular activities for undergraduate students.

David E. Claridge, P.E., has developed methodologies widely used to measure energy savings and incorporated in the International Performance Measurement and Verification Protocol. He initiated and directed development of the Continuous Commissioning process, which has been implemented in more than 100 large buildings, routinely achieving 20 percent energy savings with a payback of one year while improving comfort. He has also made substantial contributions to assessment of energy efficiency and renewable energy technologies, building-to-ground heat transfer and the energy impact of air leakage in buildings. Claridge is the author or co-author of nearly 200 papers, which have appeared in journals and conference proceedings. He serves as an associate technical editor of the Journal of Solar Energy Engineering. B.S. (1966), Stanford University.

Allan T. Kirkpatrick, P.E., is a professor and the associate head of the mechanical engineering department at Colorado State University. He is known for his contributions to engineering education and research activities in the applied thermal sciences. He has more than 70 publications, and has supervised 29 master's and six doctoral candidates at CSU. Kirkpatrick has received teaching awards from the American Society for Engineering Education and from Colorado State. He has written a textbook on internal combustion engines, a book on low-tem-

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Congratulations to New Fellows

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perature HVAC systems and holds a patent on air diffusion techniques. He also has served as associate editor of the ASME Journal of Solar Energy Engineering. Ph.D. (1981), Massachusetts Institute of Technology.

William Martin Worek is recognized for his work in combined heat and mass transfer, as one of the leading experts in the area of sorption technologies as they apply to alternate cooling technologies. The systems that use solids or liquid sorbents include zeolites, silica gel, activated carbon, activated alumina, and solutions of calcium chloride and lithium chloride or glycols, where the sorbate can be water, methanol, ammonia or carbon dioxide. The objective of his research is to develop air-conditioning systems that have the potential to control and improve indoor air quality and do not use chlorinated fluorocarbons (CFCs). Ph.D. (1980), Illinois Institute of Technology, Chicago.

ASME *Journal of Solar Energy Engineering*

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or applications of solar and other renewable energies.

2001 was an exciting year for the Journal. In the February 2001 issue, we introduced a pictorial format for publishing technical achievements. ***Solar Scenery*** features photographs or graphical displays of research results and significant new solar installations or research facilities. The objective of this section is to provide authors an opportunity to showcase their work before a full paper has been written. The technical content of the photo is explained in an extended caption (usually less than 200 words).

Two issues in 2001 were devoted to special topics. The May 2001 Special Issue on ***Solar Thermochemical Processes*** included papers from Australia, France, Germany, Israel, Portugal, Spain, Switzerland, and the United States. The guest editor was Professor Emeritus Edward Fletcher of the University of Minnesota. The November 2001 issue was devoted to ***Wind Energy.*** Dale Berg, the Associate Editor for *Wind*, organized this issue. We hope to start a tradition of publishing the special issue each November before the annual Wind Symposium held in conjunction with the AIAA meeting. Many of the contributions are expected to be outstanding papers from the prior meeting. The May 2002 issue will be devoted to Solar Thermal Power. Dr. Robert Pitz-Paal, the Associate Editor for ***Solar Thermal Power,*** is leading this effort.

I join the Solar Energy Division in acknowledging the valuable contributions and hard work of the Associate Editors. Three Associate Editors retired in December 2001: **Dr. Gary Vliet, Dr. Carlos Vargas-Aburto,** and **Dr. David Claridge,** each served the maximum of two three-year terms on the *Journal.* They will be honored at Solar 2002 in Reno.

Three new Associate Editors began their terms January 2002 and one was renewed for a second term:

- *Fundamentals and Theory* - **Dr. Moncef Krarti** is an Associate Professor in the Civil, Environmental, and Architectural Engineering Department at the University of Colorado at Boulder. He has published over 100 technical articles and manuscripts related to building energy systems and has received awards for his work from the ASME Solar Energy Division and the ASHRAE. He has also authored book chapters for two CRC handbooks and the 1999 *Advances in Solar Energy.* He served as the chair of the Conservation and Solar Buildings Technical Committee of the ASME Solar Energy Division from 1994 to 2000.
- *Conservation and Solar Buildings* — **Dr. T. Agami Reddy** is an Associate Professor in the Civil and Architectural Engineering Department at Drexel University. He authored the textbook, "The Design and Sizing of Active Solar Thermal Systems" published in 1987 by Oxford University Press (U.K.) and has 51 refereed journal publications.
- *Energy Storage* — **Dr. Mitchell Olszewski** has agreed to serve a second term. Dr. Olszewski has served in a number of capacities at Oak Ridge National Laboratory. He was the principal investigator for programs to utilize power plant reject heat for agriculture and aquaculture and the use of thermal energy storage for demand management in residential, commercial, and industrial applications. Since 1982 Dr. Olszewski has focused on developing and managing new national programs in end-use energy efficiency and space power applications. Currently he is the program manager for ORNL activities associated with the DOE Industries of the Future Best Practices Program.
- *Photovoltaics* — **Mr. Ward Bower** is a Principal Member of the Photovoltaic Systems group at Sandia National Laboratory. He currently leads their efforts for certification and development of integrated systems. He works with the National PV program, the International Energy Agency Photovoltaic Power Systems group, and several certification programs.

On behalf of the Solar Energy Division, I invite you to submit your original work to the *Journal of Solar Energy Engineering.* Authors of papers presented at ASME conferences are encouraged to submit their papers to the *Journal.* There is an automatic dual review process for papers submitted to the Division's annual Solar Conference.

I want to thank the Solar Energy Division for their support of the JSEE and the Editorial Board!

State of the SED

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Conference Participation — Obviously, conference participation is one of the most important indications of a division's success or failure. Attendance at conferences produces income for the division, but just as important, indicates how well the division is meeting the needs of the division membership. This year the SED has tried to increase attendance by 1) putting on panel discussions at IMECE of the "state of the art" in different solar technical areas, and 2) joining the American Solar Energy Society and several other solar related organizations in Washington, DC, this last spring. Both events far surpassed our expectations for attendance and we will continue this approach. At the same time, we plan to try some new approaches with joint conferences with other technical groups over the next few years (see proposed schedule later in this newsletter). Any suggestions are always welcome.

In conclusion, the SED is working hard to meet our members' needs, both by providing useful technical programming and outreach programs at the high school and college levels. I encourage you to participate with us by becoming active in the SED. Simply contact any of the division officers or just show up at our meetings and talk with us.

Stanley J. Kleis
Solar Energy Division Chair

2002 IMECE Nov 17-22 in New Orleans

Join thousands of your fellow ASME members and other engineers, and be sure to attend the 2002 International Mechanical Engineering Congress and Exposition (WAM) November 17–22 at the New Orleans Hilton and the Morial Convention Center. SED plans to host two sessions on Sunday, Nov 17. The first will look at the benefits of solar energy to society, possibly with a comparison to other options. The second will be a panel discussing certification issues in the renewable energy industry, and will encompass photovoltaics, solar thermal, and wind energy. Meetings of the technical committees, Planning Committee, and Executive Committee will be held Sunday evening. Check the ASME web site www.asme.org/congress for details on how to register. Check with Mark Thornbloom, Thornbloom@fsec.ucf.edu, for details on the SED session and how to participate.

Plans for 2003 ISEC

SED plans to host its 2003 International Solar Engineering Conference at the Mauna Kea Resort on Hawaii Island, March 16-18, 2003. We will be co-located with the AJTEC2003 conference — a collaboration between ASME's Heat Transfer Division and Advanced Energy Systems Division.

Participation of several Japanese and Korean solar and engineering societies is planned, and participants will have the opportunity to attend sessions of both conferences. The ISEC 2003 conference promises to be an excellent chance for "cross-pollination" with different technical fields, as well as with non-American research. And of course, it's set in beautiful Hawaii. Keep an eye on your mailboxes for the call for papers and make plans to attend. For more information, contact Mark Thornbloom at Thornbloom@fsec.ucf.edu, or at 321-638-1444.

Note this newsletter is also available on-line at

http://www.asme.org/divisions/solar/newsletters.html

SOLAR 2002

Sunrise on the Reliable Energy Economy

John Ascuaga's Nugget Hotel
Reno, Nevada
June 15–20, 2002

Solar 2002 is an international conference that covers solar energy-related disciplines and relevant technological, infrastructural, and political issues affecting them. This annual conference is sponsored by the Solar Energy Division of the American Society of Mechanical Engineers, the American Solar Energy Society, the American Institute of Architects Committee on the Environment, the American Society of Heating Refrigerating and Air Conditioning Engineers, the Interstate Renewable Energy Council, the Society of Building Science Educators, the Solar Ratings and Certification Corporation, and the SUNRISE Sustainable Resources Group.

All mechanical, electrical, civil, and environmental engineers, industry representatives, government officials, advanced students in solar energy technologies and related fields are encouraged to attend Solar 2002. Currently about 50 papers have been accepted by ASME's Solar Energy Division in the areas of Conservation & Solar Buildings, Fundamentals & Theory, Heating and Cooling Applications and Analysis, Photovoltaics, Solar Chemistry, Solar Thermal Power, Testing and Measurement, and Wind Energy. In addition to the ASME papers, two hundred papers have been submitted to the ASES Committees.

Several plenary sessions, forums and panel discussions will round out the program. Solar Energy Division planning meetings and Technical Committee meetings will also be held. This year, the Solar Energy Division of ASME is planning a general informational meeting Tuesday over lunch. The Banquet Tuesday evening will include award presentations for the Yellott award, graduate student award and best paper awards.

Registration information should be in the mail soon. Remember to check the ASME box on registration. Proceedings for all papers will be on CD-ROM. Hardcopy of the ASME papers will be available for a nominal fee. For more information check out www.asme.org/solar2002/

or

Registration information and a preliminary program is available at the following site: http://www.ases.org/images/'02ConfBroch.pdf Make sure to check the ASME box when registering.

Solar Energy Division Executive Committee

July 2001 – June 2002

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