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ADVANCED ENERGY SYSTEMS DIVISION

EDITOR: Laura Schaefer

FALL 2003

CHAIR'S MESSAGE

Dr. Sriram Somasundaram

It is with great anticipation and excitement that I take over the reins of the Chairmanship of the Advanced Energy Systems Division (AESD) for 2003-2004. This next year promises to be not only a time of change for ASME as a professional organization and its "new, improved" look for the membership, but also an exciting opportunity for our Division to be an integral part of the change process. The anticipation (and excitement that comes with any change) in my mind is due to the fact that the Council on Engineering (COE) is going through a dramatic process of reorganization and strategic realignment. And since AESD is a part of the Energy Resources Board (ERB), with a Vice-President (VP) representing us on the COE, we will be asked to make certain decisions as to our future roles and responsibilities within the new COE structure. As part of providing input to the reorganization process, you will be glad to hear that the Division leadership attended the Technology Executives' Conference in Houston earlier this year and provided some key thoughts. As a result, we were one of only three groups (represented by Giorgio Rizzoni) selected for further discussions with the COE leadership team. For more information on the COE's reorganization plans and the anticipated schedule, please go to *http://www.asme.org/coe* and click on the button marked "Reorganizing COE: Proposed Structure and Roadmap" where you can download a set of slides describing the implementation plan as well as the expectations for each of the ASME divisions to re-align itself within the new organizational structure of the COE. After having reviewed the various materials that are on this web site, you may either drop me a line offering your comments or suggestions regarding our future path forward or to the COE chair, Frank Adamek (*frank.adamek@us.abb.com*) who will appreciate any input you may have with regard to the proposed plans and the vision for the new, improved COE.

That brings me to the second point of anticipation: the formation of a new "**ASME Energy Institute**" (a new Unit) within the COE that I expect to not only include AESD, but also other Divisions and Boards across ASME with a common purpose of conducting business within and for stakeholders of the energy and power sectors of the government, academia and industry. It is expected that the Institute will not only be a financially self-sufficient unit, but also will conduct thematic conferences and educational programs during the year. Developing and fostering relationships with other institutes, industry units, multi-technology units, and other program units within and outside ASME will be an integral part of the mission statement of the new Energy Institute. In the course of discussing the plans for this new Institute later this Fall, I anticipate working closely with Bill Worek (*wworek@uic.edu*), the VP of the ERB, in developing the roadmap, metrics and expectations for the Institute and our Division, and in laying out the approach to you, the members of ASME, at the IMECE this November in Washington, D.C.

I wish to thank Professor S.A. Sherif for his service as AESD chair during 2002-2003, and for mentoring me and providing helpful advice so I could feel confident in taking over the reins this year. I also would like to welcome our new Executive Committee member, Dr. B.G. Shiva Prasad (whose profile appears elsewhere in this Newsletter). Dr. Shiva Prasad has been extremely active the past two years chairing the Heat Pump Technical Committee, and is expected to be a valuable addition to our team.

Finally, I would like to urge all interested members of ASME across the government, industry and academic sectors to become more involved in the activities of AESD and the eventual new Unit within the COE. All ASME business (development and dissemination of the "knowledge base") related to the fields of energy and power generation, distribution, storage and end-use are expected to be consolidated and conducted by the new ASME Energy Institute in the near future. I strongly recommend that each and every one of you actively participate and provide constructive input to the reorganization process and become a part of the new and improved ASME International. ❖

ASME Participation in IECEC and Restructuring Efforts

S.A. Sherif, IECEC Representative

ASME has decided not to continue as a participating society in the Intersociety Energy Conversion Engineering Conference (IECEC). At the end of the 37th IECEC in 2002, the IECEC Steering Committee decided to change the name of the conference to the International Energy Conversion Engineering Conference, while retaining the acronym. The first IECEC in its new format was held in Portsmouth, Virginia, August 17-22, 2003, without the official involvement of ASME. The Steering Committee approved a business plan to ensure that future IECECs are more relevant to the participants and are more financially viable. AIAA ran the 2003 conference.

The Council on Engineering (CoE) of ASME has been in a state of restructuring itself for some time. Part of the restructuring involves finding a proper venue for researchers in the field of energy to present their research work. One of the ideas being considered is the formation of an energy alliance among all groups involved in energy within ASME. The idea is to streamline the operation of the different groups and create synergy that would make ASME programs more relevant and more financially viable. These potential restructuring efforts are discussed further in the Chair's Message. ❖

Publication Opportunities for AESD Authors

M.J. Moran

Several opportunities are available for AESD authors to publish their technical articles. These include symposia, the monthly *Mechanical Engineering*, and archival journals. AESD authors are encouraged to give a tangible expression of their ASME affiliation by considering these publication outlets.

Opportunities for publishing technical papers are provided by the symposium volumes of the IMECE AESD technical sessions. Normally one or more such volumes are prepared annually, comprised of the dozens of papers presented at the IMECE. Such papers may be eligible for consideration for the prestigious E.F. Obert Award.

Symposium volumes are available for purchase at IMECE or may be ordered directly from ASME technical publications. Abstracts are generally due in January for papers to be presented at the following IMECE. Authors wanting to participate at the IMECE should check the calls for papers in the monthly meetings calendar in *Mechanical Engineering* or visit *http://www.asme.org/events/*.

Nearly every summer for several years, AESD also has participated in symposia held outside the United States at various memorable sites. The 2003 event, ECOS 2003 (Efficiency, Costs, Optimization, Simulation and Environmental Aspects of Energy Systems) was held in Copenhagen, Denmark from June 30 through July 2, 2003. ECOS 2004 will be held in Guanajuato, Mexico, from July 7 - 9, 2004. The 2005 event will be in Trondheim, Norway. Papers for such conferences are reviewed according to ASME standards, and the symposium volumes are published by ASME or commercial publishing houses. For information concerning upcoming conferences, authors should check the meetings calendar in *Mechanical Engineering* or visit *http://www.asme.org/events/*.

Additional outlets for technical articles by AESD authors are provided by the archival ASME journals, *Journal of Energy Resources Technology*, *Journal of Engineering for Gas Turbines and Power*, and *Journal of Turbomachinery*. Owing to peer review requirements and some queuing of accepted papers before publication, a year or more can elapse between submission and publication. Still, archival journals are the appropriate forum for articles of enduring value. Prospective authors should see current issues of the journals for submission instructions.

Periodically, AESD has a special section in *Mechanical Engineering*. Special sections are comprised of articles submitted by various AESD technical committees on a rotating basis. Members interested in participating in this activity should contact the AESD chair and/or their technical committee chairs.

For answers concerning your questions about AESD publishing opportunities contact M.J. Moran (contact information is provided at the end of the newsletter). This newsletter also welcomes articles of general interest to the Division membership. Interested authors should contact Laura Schaefer, the Newsletter Editor, at the address given in the roster at the end of this publication. ❖

AESD News and Announcements

- Michael von Spakovsky will be the new AESD representative to the Scientific Committee for the Annual Fuel Cells Conference, which is held in Rochester, New York. As such, he will not only help with the technical programming at the Conference, but also will provide strategic directions to the fuel cell community. The First International Conference on Fuel Cell Science, Engineering and Technology was held on April 21-23, 2003, and included presentations by a number of AESD members. The Second International Conference will be held June 14-16, 2004.
- Michael Moran will replace Gordon Reistad as the new AESD representative to the Energy Committee in addition to his Special Publications liaison role.
- The Division has embarked on a collaborative initiative with the K-6 Committee on Heat Transfer in Energy Systems in organizing joint sessions at the International Mechanical Engineering Congress and Exposition.
- From July 2002 to June 2003, membership in the AESD increased by 21.57%. Total primary membership stands at 1189 members. ❖

AES Keynote Lecture, Division Awards, and Committee Reports

The AES Division recognizes the contributions of its members and researchers and educators in Advanced Energy Systems at the annual AESD Luncheon at the IMECE. The contributions of these individuals are truly outstanding and are one of the main reasons for the continued advancement of energy related technology. The Awards Luncheon also offers the opportunity for attendees to hear from a leading expert on issues at the forefront of such research and technology.

At the 2002 IMECE, Robert G. Watts, a world-renowned expert on the greenhouse effect and a professor in the Department of Mechanical Engineering at Tulane University, gave a thought-provoking talk on Global Climate Change. Dr. Watts spoke about the engineering response to global warming, and on innovative energy strategies for carbon stabilization. A lively discussion followed Dr. Watts' very interesting presentation.

Dr. Landis D. Kannberg is scheduled to be the speaker at the 2003 AESD Luncheon on Thursday, November 20, 2003. His topic will be "Perspectives and Solutions to the Recent Power Blackout in the Northeast." Please buy your luncheon tickets in advance to hear more on this timely topic, and visit the IMECE web site for more details.

The following awards will be given at the 2003 IMECE:

The *Edward F. Obert Award* recognizes an outstanding paper on thermodynamics authored during the preceding two calendar years. In 2002, Luis Serra, Antonio Valero, and Vittorio Verda were selected for their papers on "Thermoeconomic Diagnosis: Zooming Strategy Applied to Highly Complex Energy Systems." The first paper (part I) focused on the detection and localization of anomalies, and the second paper (part II) examined the choice of the productive structure. The Obert Award is a society level award and will be presented at the President's Luncheon.

The 2002 *Heat Pump Technical Committee Best Paper Award* will be given to A. Kovacevic, N. Stosic and I. K. Smith for "Numerical Simulation of Fluid Flow and Solid Structure in Screw Compressors." The award also carries a $500 cash award. At the 2002 congress, HPTC was hoping to select a recipient for the *Best Student Paper Award*. However, the criteria for nominating student-presented and authored papers were not met. Therefore, no *Best Student Paper Award* will be given for the 2002 congress.

The Systems Analysis Technical Committee chose two papers from 2002 for awards. The *Best Paper Award* will be presented to Michael G. Izenson and Roger W. Hill for "Water Balance in PEM Fuel Cells." The *Best Student Paper Award* will be given to Lin Wang, Attila Husar, Tianhong Zhou and Hongtan Liu for their paper "Parametric Study of PEM Fuel Cell Performances." Plaques and checks will be presented to these authors at the AESD Luncheon.

Additionally, the following members of the AESD were elected Fellows of ASME during the previous year: Dr. Karen R. Den Braven, Dr. Mounir B. Ibrahim. Congratulations and a hearty thanks to all these awardees! ❖

Direct Thermal Power Conversion and Thermal Management

This committee promotes research and development in all areas of direct conversion of heat to electric power without any moving parts or thermal management of energy. Direct thermal energy conversion devices include thermionics, thermoelectrics, AMTEC (alkali metal thermal to electric converter), and TPV (thermophotovoltaics). All areas of thermal management including aircraft and spacecraft, ground vehicles, electric components and power systems, and industrial energy systems are covered. The committee participates in the IECEC, IMECE, and other conferences related to advanced energy systems. During this year, the committee has organized five sessions at the First International Energy Conversion Engineering Conference (IECEC), held in Portsmouth, Virginia, in August 2003, and one session at the IMECE, to be held in Washington, D.C., during November 2003. ❖ *Muhammad Rahman*

Heat Pumps

The Heat Pump Technical Committee (HPTC) has maintained an active role in disseminating the latest developments in theoretical and applications aspects of heating and cooling technologies, which have been changing rapidly in recent years. The national and global emphasis on energy efficiency and the environment has provided numerous exciting opportunities for heating and cooling research and development. New developments include advanced electric and heat-activated chiller and heat pump systems; cooling, heating, and power (CHP) technologies; novel and environmentally friendly refrigerants and working fluids, including corrosion inhibitors; fundamental heat and mass transfer issues in heat pump components; novel heat exchanger materials and designs; system simulation; integration and implementation issues; and compressor design.

The HPTC strives to help carry the development of these technologies from theoretical concepts to viable applications, with a mix of contributions from industry, academia and the government. During the 2002 IMECE in New Orleans, the HPTC sponsored four technical sessions, one panel session, and an invited paper session which were well attended. At the 2003 IMECE in Washington, D.C., five technical sessions and one panel session have been organized by the HPTC.

The HPTC meets once a year at the IMECE. The 2002 committee meeting was well attended. At the 2002 meeting, Dr. B.G. Shiva Prasad transferred the Chairmanship to Dr. Abdi Zaltash of Oak Ridge National Laboratory (ORNL), who was the Vice-Chair. Dr. Laura Schaefer of the University of Pittsburgh was inducted as the Vice-Chair of the committee. An election was held for the position of Secretary and Dr. Greg Nellis of the University of Wisconsin was nominated and unanimously approved for this position. Dr. Schaefer previously held the position of Secretary. Researchers interested in the above-mentioned topics and other related issues are encouraged to attend and participate in the activities of this committee. ❖ *Abdi Zaltash*

Energy Systems Miniaturization

Professor Jay Kapat of the University of Central Florida has taken up the responsibility of the Chair of this committee from Professor Rich Peterson. The committee thanks Professor Peterson for guiding the committee in its early, formative years. Dr. Channy Wong of Sandia National Laboratories has been contacted to be the Vice-Chair, and has accepted the position. The primary objective of the committee in the next year will be (1) to have a membership drive with balanced membership from academia, industry and government labs, (2) to have the annual committee meeting at the 2003 IMECE in Washington, D.C., (3) to sponsor two sessions at the 2004 IMECE, and (4) possibly to have one session at the 2004 IECEC. ❖ *Jay Kapat*

Superconductivity

The Superconductivity Technical Committee provides a forum for presenting the most recent progress in the field of applied superconductivity. The committee continues its efforts in sponsoring paper sessions, including those co-sponsored in conjunction with other ASME committees. New members are sought to bring in new ideas and to help coordinate future activities. Information on this committee can be obtained by contacting the committee chairman, Dr. Ming Chyu. ❖ *Ming Chyu*

System Analysis

Eight technical sessions and two panel discussions comprise the *Symposia on Thermodynamics and the Design, Analysis, and Improvement of Energy Systems*, organized for the 2003 IMECE by the Systems Analysis Technical Committee. The authors of the papers that will be presented at these sessions come from thirteen different countries (Switzerland, the United States, Italy, Germany, the Netherlands, India, Iran, Japan, China, Mexico, Brazil, Norway, and Denmark), indicating worldwide interest in our symposia. The two panels are on topics of strong current interest with respect to the growing and changing field of energy systems: "Transition to Hydrogen and the Future Hydrogen Economy," and "The Role of Mechanical Engineering in the Fuel Cells Revolution," and have the participation of panelists from government, industry and academia.

To encourage the participation of young researchers, the Technical Committee has instituted the *Best Student Paper Award*, for papers in which the first author and presenter is a student. Two other awards are also given by the TC: one to the best paper presented at the symposia, and also the prestigious *ASME Edward F. Obert Award*. ❖ *Abel Hernández-Guerrero*

Hydrogen Technologies

This technical committee promotes communication between all people that work on hydrogen technologies, including hydrogen production, storage, utilization, system analysis and safety.

Hydrogen can be produced exclusively from H_2O using electricity and/or heat from solar, wind, fission, or fusion sources. H_2 can therefore uniquely serve as a versatile and universal energy carrier for all carbonless power sources, the crucial element of a global energy system free of air pollution, CO_2, and other greenhouse gases. If generated using renewable energy, H_2 is an inexhaustible fuel, since it relies on cyclic use and reuse of the cleanest, most abundant, natural, and elementary substances: H_2O, O_2, and H_2.

The hydrogen technologies committee urges people from industry, academia and government to share their experience with the international community. Those wishing to participate by contributing papers or helping to organize the session can contact Joel Martinez-Frias (contact information at the end of the newsletter). The committee appreciates all suggestions of activities that can be performed to improve the role of this forum. ❖ *Joel Martinez-Frias*

Fuel Cells

The fuel cell committee activity has been limited recently to the PTC-50 fuel cell performance test code work. We welcome input and participation from others on fundamental and applied issues pertaining to the development of fuel cells. ❖ *Tony Leo*

Stirling Engines

Since the days of large government support for Stirling power systems for space and automotive use, those technologies have languished, looking for practical markets. Recently, the position of Stirling power was solidified by NASA flight qualification of isotope-heated generators from Stirling Technology Company, validating decades of careful development work in small, efficient generation. At the same time, a New Zealand company, Whispertech, has introduced a portable power unit for recreational use, achieving one of the long-named goals of the field, and plans a small co-gen unit on the same base. Additionally, Praxair, Inc., the largest air-separation company in the Americas, has adopted the acoustic variant of Stirling cycle equipment for on-site liquefaction of gases and is announcing its first product at the Cryogenic Engineering Conference & Expo in September. Clever Fellows Innovation Consortium, Inc., will introduce its first commercial cryocooler model there as well.

Meanwhile, research has turned to development in other applications, including household refrigeration and, most famously, replacement power for the two-wheeled personal transport called "Segway." It seems that the long-delayed promise of Stirling is beginning to bear fruit. Perhaps the right questions are now being asked. The activities of ASME's Stirling section are minimal now, since the publication of performance reporting standards some years ago.

Members interested in rejuvenating this section (now a Technical Liaison) are invited to contact John Corey, the current correspondent. ❖ *John Corey*

Professor Robert Krane of the University of Tennessee passed away on August 28, 2003. Dr. Krane was a past chair of the Systems Analysis Technical Committee, served as past associate technical editor of the Journal of Energy Resources Technology, and was active in the AESD. He will be dearly missed by his friends, colleagues, and students.

B. G. Shiva Prasad Named to Executive Committee

Dr. B. G. Shiva Prasad, an active member in the Heat Pump Technical Committee since 1994 and its past chair, is a new Executive Committee member for the AESD. He holds a Ph.D. degree in Aeronautical Engineering from the Indian Institute of Science. His interests are multidisciplinary, and he believes in advancement of science and technology through transplantation. However, his main research and professional thrust for more than two decades has been in the area of fluid mechanics and heat transfer, particularly with reference to boundary layers and turbulence, as well as the aerodynamics of positive displacement and turbomachinery. He has worked on the effects of curvature, unsteadiness and separation on turbulent flows, and has authored or co-authored several publications covering those topics, as well as on the thermofluid mechanics of compressors.

As a member of the CFD Technical Committee of the Fluids Engineering Division, he has worked towards establishing checks and balances on the application and use of CFD, and also for enhancing its growth and development as a viable industrial tool. Furthermore, he has been actively organizing panel sessions for discussing the need for coordination amongst industrial users, researchers in universities and laboratories, code developers, and sponsors for establishing industrial benchmark flow field configurations rather than relying on simple, laboratory test cases. On behalf of the HPTC, he is simultaneously pushing for the application of CFD to positive displacement compressors, which are an important part of many heat pumps providing comfort to human beings. ❖

Integrated Energy Systems (IES) Facilities

Abdi Zaltash, Oak Ridge National Lab • Reinhard Radermacher, U. of Maryland

The problems caused by deregulation of the electric energy market in the United States and other developed countries has created a major opportunity for the implementation and use of distributed energy (DER) technologies with and without waste heat recovery. A 2001 report prepared by the National Energy Policy (NEP) Development Group identified combined heating, cooling, and power (CHP), or Integrated Energy Systems (IES), as a key strategy for addressing increased energy demands and peak power issues. Recent developments in distributed generation technologies have opened up new opportunities for small-scale IES that can be used in commercial buildings. New prime movers, such as microturbines, fuel cells, reciprocating engines and others, in combination with thermally-activated technologies (TAT), which use waste heat either for heating purposes or thermally-driven desiccant dehumidification and absorption cooling, are a major driver for making IES viable and eventually cost and energy effective.

Facilities for developing and testing Integrated Energy Systems under a variety of conditions are being developed at a number of institutions. These facilities will allow the interaction of the IES components to be optimized, and will increase their efficiency and commercial viability. Two such facilities with complimentary programs are described below: the IES Laboratory at the Oak Ridge National Lab, and the Integration Test Center at the University of Maryland.

The IES Laboratory at ORNL: A National User Test Facility

The IES Laboratory is a National User Facility for testing combined heating, cooling, and power (CHP) or integrated energy systems (IES) for commercial building systems. It was dedicated last summer at the Department of Energy's Oak Ridge National Laboratory (ORNL). Currently, the laboratory employs a microturbine-based IES system that consists of the microturbine-generator for electric power generation and thermally-activated technologies for waste heat recovery. The TAT systems include a water-to-air heat recovery unit or heat exchanger, direct and indirect-fired desiccant dehumidifiers, and an indirect-fired single-effect absorption chiller.

The IES Laboratory is part of the U.S. Department of Energy's (DOE) effort to encourage the use of energy-efficient distributed generation (DG) systems, in which users generate part or all of the electricity they use on their own sites. It is not only a way of reducing power demands and growth, which are stressing electric generation and distribution capacities, but it also brings the generation closer to the load, where the waste heat can be used to meet the thermal loads in addition to the electric loads. The major purpose of the IES Laboratory is to provide a technical capability for developing technology to improve the overall energy efficiency and utility load characteristics of IES end-use equipment, their integration, controls, and packaging, and to encourage the use of IES. The objectives of the work at the IES Laboratory include:

- Supporting the NEP's use of energy-efficient DG systems in the supply of electricity and thermal energy to business and industry,
- Demonstrating the use of IES in recapturing and using thermal energy that is wasted as discarded heat in conventional power plants,
- Testing the ability of IES to achieve resource efficiencies of 40% to 70% or more,
- Focusing on research in the areas of innovative integration of DG, heat recovery, and thermally activated cooling and humidity control technologies into high-efficiency IES,
- Working on IES performance evaluation, advanced thermal components, and system modeling and optimization,

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- Supporting rating/certification standards for IES products, and
- Offering access to businesses and industry in assessing various system components for evaluation and improved performance.

The IES Laboratory provides the capability for individual and independent performance testing of DG and heating, ventilating, and air conditioning (HVAC) systems as well as the performance testing of DG and TAT systems combined into an IES. Not only is the IES Laboratory a unique facility for testing the integration of individual IES components under various operating performance modes and configurations, but it is also a testing facility for research, development, and deployment of packaged IES for buildings as well. The IES Laboratory brings together in one location many closely interrelated experimental research capabilities including a number of unique equipment/components for IES and TAT research and development. The Laboratory has a unique and flexible design that provides for the testing of various thermal heat recovery units as well as various DG systems along with their different operating modes (Figure 1). The IES Laboratory is instrumented and configured to operate without and with waste heat recovery from the exhaust of DG units such as microturbines, reciprocating engines, and fuel cells.

The current configuration is using a 30-kW natural gas-fired microturbine; however, it can and will be extended to encompass many other DG systems. The thermal recovery components include a second-generation heat recovery unit (HRU) with the desiccant dehumidifiers and an absorption chiller. An air duct network routes the hot exhaust from the microturbine to the HRU and/or the direct-fired thermal equipment, a water loop from the heat exchanger routes hot water to the indirect-fired thermal equipment, and an air mixer (for mixing outside air with exhaust air) provides for flexible testing of various waste heat recovery conditions and loadings. In addition, the microturbine's hot exhaust gas can also be varied by changing the power output to test different waste heat source conditions. The IES Laboratory has been instrumented to collect electrical and thermal data related to the performance of the DG and waste heat recovery components. The data includes the voltage, current, and electric power output (kW), rotating speed of turbine, and heat output of the DG input; air flows throughout the duct network; water flows throughout the water loops; and energy and heat input and energy output from the various thermal recovery systems. Initial laboratory evaluations have focused on the effective integration of current CHP thermal recovery and thermally activated cooling and humidity technologies.

The recent laboratory test results with the microturbine-based IES are shown in Figure 2. The results show that the addition of the direct-fired desiccant dehumidification unit to a microturbine/heat recovery unit in the IES increases system efficiency by 7% over the microturbine/heat recovery unit only. Thus, an overall IES efficiency (electrical plus thermal) of 60%, based on the HHV of the natural gas, is achieved.

The IES Laboratory has enabled the development of an IES Mathematical Model, a predictive modeling tool that provides the framework for how the IES should perform within the constraints of the individual DG and TAT components, as well as how a packaged IES could perform. Currently, this model only addresses the use of a 30-kW microturbine for the DG source; however it will be updated to include other DG systems as they are tested at the IES Laboratory. The modeling approach is to collect data on individual DG and TAT components, and on integrated system performance over a range of tested operations. The testing results are then used to optimize the performance and design of the components and the IES. This provides important information to improve the technology, reduce its lead time for introduction to the marketplace, and reduces the potential risk of operating IES for business and industry.

The designation of the IES Laboratory as a National User Facility expands options for working directly with business and industry in developing and testing effective design and performance of IES that will meet future needs. In this role, the Laboratory will test package systems and model modular systems for industry to help improve the technology and accelerate its introduction to the market. A competitively awarded contract of $19 million in federal government support (via DOE) to seven industry teams along with industry cost sharing is providing for the development of packaged IES. The IES laboratory will play an important role for the testing of IES packaged systems from

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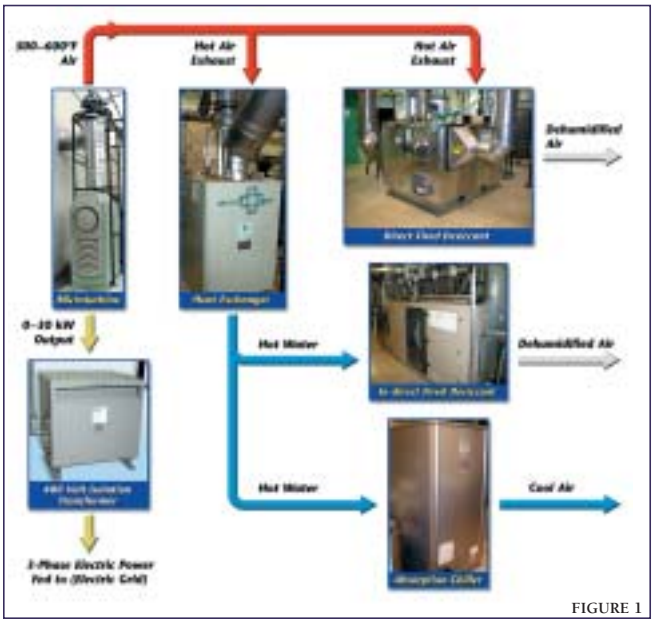

FIGURE 1

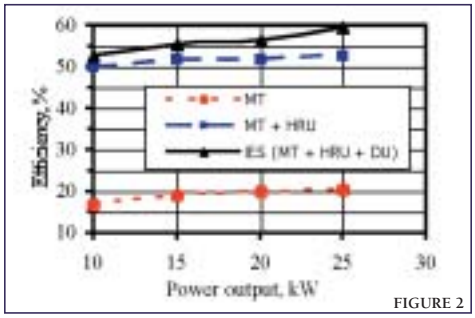

FIGURE 2

Energy Track at the 2003 IMECE

Laura Schaefer

At the 2002 IMECE, ASME organized technical sessions, panel discussions, and invited talks in various tracks that spanned several different energy-related disciplines and divisions. Overall, fifteen sessions were presented in the Energy Track on topics such as the security of the energy infrastructure, the future of fossil fuel and renewable resources, and global climate change. All of the Energy Track sessions were well attended, and generated lively discussions among the participants.

Based on the success of these sessions, an Energy Track will once again be offered at the 2003 IMECE. Thirteen sessions are scheduled during the latter half of the week, and will focus on subjects such as advanced heat exchangers for energy systems, environmental engineering, recent advances in modern power technology, and emerging problems in thermal management. ❖

Integrated Energy Systems (IES) Facilities - *continued from page six*

these industry partners. Future roles of the laboratory as a National User Facility also include assessing controls, providing advanced diagnosis, and assessing thermal energy storage.

The Integration Test Center at the University of Maryland

The Center for Environmental Energy Engineering (CEEE), a research group within the Mechanical Engineering department of the University of Maryland (UMD) carries out research and testing on the Heating Ventilation Air Conditioning (HVAC) systems at an occupied office building on the university's campus – the Chesapeake building. Two completely independent IES/CHP systems (Figure 3) are installed at the building, serving the two HVAC zones inside the building.

Both systems recover waste heat from a natural gas driven prime mover, although both systems have run successfully on propane during the 2002 cooling season. Because the heat is provided to the Chesapeake building using electric reheat, there is no mechanism to utilize the waste heat for space heating in the winter months and the test systems only operate during the cooling season.

The test facilities at UMD are an excellent partner for the systems at ORNL because the operating conditions are those experienced by a real building rather than an experimental facility. Test conditions cannot be arbitrarily chosen at the Chesapeake building, but the system's operating characteristics can be chosen so that they match those of the building as seamlessly as possible. The challenges at UMD are also those of controls and communication, as the two systems must tie in with the existing HVAC equipment. Both systems supply sensible cooling with a retrofitted coil in the Roof Top Units (RTU), as well as supply dehumidified ventilation air using waste heat activated desiccants.

Research work so far points to the importance of isolating system components from each other when combined into packaged units, and to the significance of parasitic power in CHP cooling applications. Modifications to the original solid desiccant operation will also improve future IES performance at the building.

Other ongoing work going within the CEEE in the CHP field includes modeling small and large scale CHP systems in thermodynamic software packages. A 27 MWe CHP plant will be commissioned at UMD, supplying 100% of the thermal (steam) load and approximately 60% of the peak electrical load for the campus. Two graduate fellows are assigned to the task of modeling the building's IES. This provides a way for the expertise of the group to develop across a wide scale of the IES system. The CEEE goals are the single or multi-objective optimization of thermal systems for cost, volume, weight or other desired product properties. ❖

FIGURE 3

ADVANCED ENERGY SYSTEMS DIVISION 2003-2004

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Mark your Calendars!

AES Division Extremely Active at IMECE in Washington, DC (November 16-21, 2003)!

The AES Division has planned a very stimulating technical program at this year's IMECE in Washington, DC. A total of 17 sessions (including panel sessions) on current topics will be held. The papers scheduled in these sessions include numerous contributions from outside the U.S. and from industry, demonstrating the wide-ranging and global appeal of the technical topics being addressed by the AES Division. A list of session titles is provided below. Division members are also organizing several symposia for the 13-session Energy Track, discussed elsewhere in this newsletter. Please be sure to participate in these informative sessions and add your valuable input wherever possible, especially during the discussion period at the end of each paper or panel presentation. We hope to see you there.

Direct Thermal Energy Conversion/Thermal Management Technologies And Systems
Direct Thermal Energy Conversion/Thermal Management Technologies and Systems

Analysis and Applications of Heat Pump and Refrigeration Cycles and CHP (Combined Cooling, Heating and Power)
Heat and Mass Transfer in Heat Pump/Refrigeration Cycles
Fluid Mechanics and Heat Transfer in Positive Displacement Compressors
Innovative Technologies for Active Cooling
Emerging and New Technologies for Heat Pump and Refrigeration Cycles and CHP (2 Sessions)
CFD Application for Positive Displacement Compressors – Has/Can It Become a Design Tool? (Panel Session)

Thermodynamics and the Design, Analysis, and Improvement Of Energy Systems
Energy Systems Analysis and Design (2 Sessions)
Fundamentals of Thermodynamics
General Thermodynamics and Energy Systems
Thermodynamics and Energy Systems
Fuel Cells and Hydrogen Technologies
Fuel Cell Technology
Low/Zero Emission Power Plants and Efficient Energy Systems
Transition to Hydrogen and the Future Hydrogen Economy (Panel Session)
The Role of Mechanical Engineering in the Fuel Cells Revolution (Panel Session)

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Technical Interests and Comments: