

Partnering Partnering

for

Success



U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy



Partnering Partnering

Partnering for Success features companies and organizations that have not only worked in partnership with DOE's Office of Energy Efficiency and Renewable Energy (EERE) during the last year, but have also gone the extra mile to raise awareness of the benefits of industrial energy efficiency. EERE partners with hundreds of companies and organizations during the year, and they all make substantial contributions to our energy efficiency goals. We acknowledge their efforts, and regret that we cannot feature all of them here.

However, EERE also offers partners other opportunities for recognition, such as case studies and articles in our newsletters that highlight successes; Showcases and other energy events that demonstrate new technologies and improvements; and our Web site that contains news and information on EERE and partner activities.

In addition, EERE presents three special awards at our bi-annual Expo:

- Partner of the Year recognizes an individual who exhibits extraordinary initiative and commitment to advancing the goals of Industry of the Future partnerships. He or she promotes and advances energy efficiency as a national goal beyond the needs of his or her organization or industry, and engages in innovative approaches to joint public-private partnerships.
- Technology of the Year goes to an EERE-supported technology that exhibits exceptional commercialization potential and significant potential for energy efficiency improvement, and economic or environmental benefits.
- Plant of the Year is based on documented energy savings, replication of emerging technologies, the plant's history of progressive efforts to reduce energy use, strategies for continuous improvement for energy efficiency, and use of a project implementation plan that includes funding commitments and ongoing validation of completed projects.

The nomination period for the 2003 awards is May 9, 2002 to September 15, 2002. See the EERE Partnership Awards brochure for information about the process and how to submit a nomination. Visit our Web site at www.eren.doe.gov or call the Clearinghouse at 800-862-2086 for copies of the brochure and nomination forms.



Welcome. The companies and organizations featured here all have one thing in common. They are working in partnership with the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) toward a more competitive future. Collectively, they contribute to significant advances in the development of energy efficiency technologies, increased productivity, and enhanced environmental performance for U.S. industry. Their actions have contributed substantially to improving the energy intensity of the U.S. economy as called for in the President's National Energy Policy.



The participation and activities of these companies and others are wide-ranging. Through the Industries of the Future (IOF) strategy, they are involved in charting future visions for their industries and creating roadmaps to ensure these visions are realized. They lead research and development projects that often find competitors collaborating. They perform comprehensive energy assessments at their facilities that result in substantial energy savings.

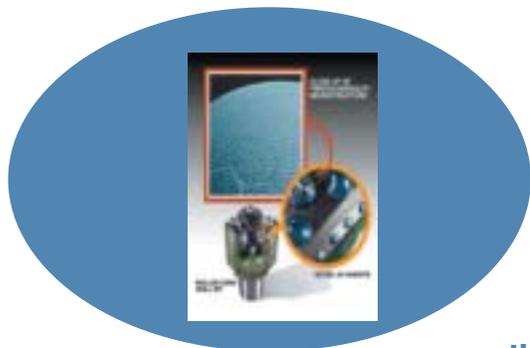
These companies promote awareness of the benefits of industrial energy efficiency through industry showcase events, regional energy events, training sessions, Web sites, and publications. They not only carry this message to their customers, but they practice it every day. Many of these companies have created a corporate culture that rewards energy efficiency awareness and innovation. Some have worked to develop industry standards for efficient performance of energy-intensive systems, such as motors and pumps. Others have replicated initial findings at multiple facilities with impressive results.

Please join me in recognizing our partners' dedication and commitment to increasing industrial energy efficiency and productivity, and reducing waste, while helping to strengthen our economy and national energy security. We are proud of our mutual accomplishments and invite your company's participation in future activities. Visit our Web site at www.eren.doe.gov to see how you can help us partner for success!

Sincerely,

Denise Swink
Office of Energy Efficiency
and Renewable Energy

for
Success
Success



Advanced Ceramics Research is developing fibrous monolith wear-resistant components that will bring estimated energy savings of 2.7 trillion Btu per year in 2010 and 7.8 trillion Btu per year in 2020.

Advanced Ceramics Research Inc. (ACR) develops state-of-the-art, high-temperature, high-performance ceramic materials and processes. It has been an outstanding collaborator in all aspects of Mining Industries of the Future (IOF) implementation. ACR's participation with the Mining IOF is led by its President and CEO, Anthony Mulligan. Advanced Ceramics Research has:

- Provided industry expertise in Mining Roadmap workshops.
- Hosted a 2001 brainstorming forum of mining executives, university professors, and others to discuss opportunities for application of advanced materials to save energy in the U.S. mining industry.
- Championed the Mining IOF strategy in Arizona and throughout the industry. For example, ACR is working with a local community college, owned by the Tohono O'odham Tribe in Tucson, to train individuals how to manufacture advanced ceramics.
- Assisted in technology transfer. For example, during the 2001 National Mining Association's MineExpo, the largest exposition in the mining industry, ACR participated with the Mining IOF to demonstrate advanced materials that hold energy saving potential in mining.

In current Mining IOF research and development, ACR is developing fibrous monolith wear-resistant components to increase the wear life of mining drill bit inserts, point-attack tools, dozer teeth, and hydro-cyclone apex tools. This will significantly improve energy efficiency by increasing the duty-life of these components. Estimated energy savings for the industry are 2.7 trillion Btu per year in 2010 and 7.8 trillion Btu per year in 2020. It also will reduce operating costs in U.S. mines, thereby improving competitiveness.

Founded in 1908 and today boasting over 50,000 members, the American Institute of Chemical Engineers (AIChE) is the original association focused on advancing the chemical engineering profession. AIChE dedicates itself to fostering and disseminating chemical engineering knowledge to industries including energy, chemical, biotechnology, food, electronic, and pharmaceutical, while applying the expertise of its members to societal issues such as sustainable development, the environment, human health, and water management and reuse.

As the global leader of the chemical engineering profession, AIChE stresses the development and exchange of relevant knowledge throughout the world. The institute works to stimulate collaborative efforts among industry, universities, government, and professional

Collaborative efforts that leverage resources of industry, universities, government, and other professional societies are crucial for the identification of R&D needs and the development of technology that can be applied to societal issues in all parts of the world.
—Joseph Rogers
AIChE

societies, while encouraging other engineering and scientific professionals and entities to participate in its own R&D ventures.

Working as an Office of Energy Efficiency and Renewable Energy (EERE) Allied Partner, AIChE offers the time and expertise of its members to review the EERE research project portfolio and the development and application of promising technologies. The institute conducts BestPractices training events in its regional chapters throughout the United States and assists the Chemical Industries of the Future (IOF) with BestPractices outreach to chemical plants.

In the past year, AIChE assisted in the development of the Vision2020 Separations and Reaction Engineering Roadmaps and arranged a topical conference held in March 2002 to showcase technologies being developed under the Chemical IOF portfolio. Currently, the institute is collaborating in the development and standardization of new energy efficiency metrics and benchmarks, as well as a CD-ROM for the chemical industry that includes energy efficiency tools and resources for training programs and new technology developments.



As the world's only supplier of both gas and chemical products, Air Products and Chemicals, Inc. is a leader in global electronics and chemical processing industries and a long-time innovator in the steel, metal, glass, and food processing manufacturing sectors.

Air Products conducts fundamental research across various technology platforms in the fields of materials, chemistry, processing, and chemical engineering. The company actively seeks out long-term research partnerships with individual researchers, universities, other companies, industrial consortia, and U.S. and foreign government agencies and laboratories, including the U.S. Department of Energy. Among these research partnerships are two with EERE:

Catalytic Hydrogenation Retrofit Reactor—Working with Johnson Matthey developing a new reactor system to serve as a catalyst in industrial hydrogenation processes. The new system will be easily retrofitted onto existing commercial batch stirred-tank reactors to replace slurry catalysts used during hydrogenation processes in the fine and specialty chemical industries. Projected benefits include:

- Elimination of problems in areas of environmental contamination, waste production, industrial hygiene, and process safety
- 12 percent reduction in energy use
- Improved yield
- Reduced operational costs.

Pressure Swing Adsorption for Product Recovery—Working to identify existing adsorbents and develop new adsorbents and processes for the recovery of products such as hydrogen from processing waste streams. Projected benefits include:

- Potential recovery of 80,000 metric tons of hydrocarbons per year, saving 336,000 standard cubic feet per day of natural gas from U.S. polyolefin plants
- Decreased NO_x, CO₂, and VOC emissions.

We can increase and strengthen our technological options for the future through early-stage participation in partnerships with EERE.
—Phil Winkler
Air Products and Chemicals, Inc.

Along with these partnerships, Air Products is working on two Chemical Plus projects—direct capture of products and computation methods for chemical and physical properties—and, as a founding member of the Chemical Industry Vision2020 Partnership, holds a chair on the Vision2020 steering committee. The company also has participated in all four DOE-EERE-sponsored Industrial Energy Efficiency Exposition and Symposiums held to date.

Alcoa, Inc. is the world's largest producer of primary aluminum, finished aluminum products, and alumina. In addition, Alcoa's aluminum products and components are used worldwide in aircraft, automobiles, beverage cans, buildings, chemicals, and a wide variety of industrial and consumer applications.

Alcoa is a long-time partner with DOE's Office of Energy Efficiency and Renewable Energy (EERE) and an important participant in the development of industry roadmaps and vision documents. Alcoa is currently the principal partner in three EERE research projects and a partner/contributor to ten R&D projects. Alcoa is a world class R&D organization that contributes research efforts with EERE on high-risk, industry changing technologies (i.e. carbothermic reduction and inert anodes).

Alcoa recognizes the benefits of partnering with EERE on BestPractices, Industrial Energy Assessments, and the 2001 Utah Industrial Showcase. During the Showcase, Alcoa demonstrated new energy-saving and environmentally friendly technologies implemented with EERE support at its Spanish Fork, Utah, facility. Alcoa's recent activities with EERE include:

- **DOE BestPractices Training**—Alcoa and EERE held a three-day training session on pumping systems and motors, adjustable speed drives, and compressed air systems for over 30 Alcoa employees.
- **Energy Assessments**—Alcoa has conducted energy assessments that identified significant saving opportunities. EERE's plant-wide energy efficiency assessments at Alcoa's Lafayette, Indiana, and Bauxite, Arkansas, facilities identified potential annual savings of \$1.9 million and \$1.1 million, respectively. Colorado State University, one of EERE's Industrial Assessment Centers, completed an assessment of Alcoa's Spanish Fork plant and identified more than \$800,000 in potential savings.
- **Emerging Technologies**—Alcoa has evaluated the use of air/oxy-fuel furnace burner technology and the vertical flotation furnace for melting recycled aluminum that were developed by other EERE partners.
- **Broadcasting Energy Benefits**—Alcoa wrote a white paper on "Energy Conservation in its Extrusion Operation" for its plants, and it produces a quarterly energy conservation newsletter for its operations worldwide. In addition, Alcoa developed an energy efficiency self-assessment on its intranet, which allows Alcoa locations to measure themselves against industry best practices.



Carbothermic reduction of alumina is a new aluminum production process

Alcoa is a long-time partner with EERE and an important participant in the development of industry roadmaps and vision documents.

Alliance to Save Energy

Aluminum Association

The Alliance to Save Energy and DOE's Office of Energy Efficiency and Renewable Energy (EERE) have collaborated for nearly a decade in advancing energy efficiency in manufacturing. Both organizations recognize the key roles played by industrial technology and energy management in our economy, environment, and national security.

As a non-profit organization, the Alliance mobilizes a progressive coalition of Associate Members that participate in the market for energy efficiency. By conducting trade shows, seminars, and media presentations, the Alliance leverages the resources of these associates, and effectively extends EERE's outreach efforts. It has advanced the energy efficiency dialog both within and beyond U.S. borders.

Industrial sector collaboration between EERE and the Alliance has primarily focused on steam systems. This partnership created the Steam Challenge, now known as "BestPractices Steam," and generates technical steam references and media for the benefit of industry.

As a precursor to the steam program effort, the Alliance conducted a series of roundtables with industry in several locations across the country. The resulting report, *Understanding the Energy Efficiency Investment Decisions of Smaller Manufacturers*, was released in April 1995. This study identified the barriers to implementing energy efficiency in manufacturing. Its findings influenced EERE's ensuing program and outreach to industrial plant managers.

The Alliance extends industrial technologies and practices beyond the United States through its International Programs division. In general, this entails the presentation of materials through educational trade missions. Alliance Associates play a key role in filling out the agendas of these missions.

Other collaborative activities in recent years include the FEMP steam workshop, conducted in 2001 for the benefit of over 100 federal and military facility managers, and the Industrial Energy Benchmarking Forum. Read more about the Alliance's industrial activities at www.ase.org/programs/industrial.



A Steam best practice, color-coded piping supports Connecticut's Steam Operations

The Alliance to Save Energy and EERE have collaborated for nearly a decade in advancing energy efficiency in manufacturing.

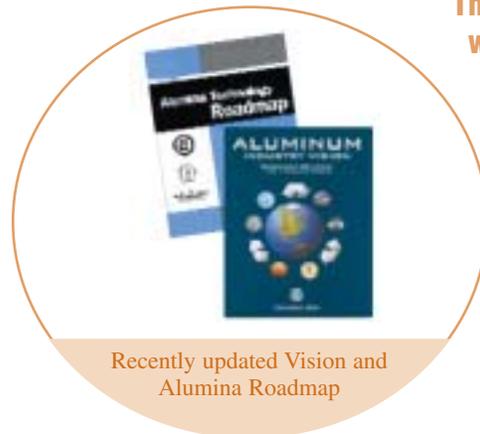


The Aluminum Association, Inc. is the U.S. trade association for producers of primary aluminum, recyclers, and producers of semi-fabricated aluminum products. The Association provides leadership to the industry through its programs and services, which aim to enhance aluminum's position in a world of proliferating materials, increase its use as the "material of choice," remove impediments to its fullest use, and assist in achieving the industry's environmental, societal, and economic objectives. Member companies operate about 200 plants in the United States and many conduct business worldwide.

The Aluminum Association is an instrumental partner in the DOE Office of Energy Efficiency and Renewable Energy (EERE) Industries of the Future strategy. In 1996, the Aluminum Association signed a compact with the Secretary of the U.S. Department of Energy agreeing to work together to promote energy efficiency. The Aluminum Association leads in the development of the Aluminum Industry Vision and Technology Roadmaps. Recent efforts include:

- *Aluminum Industry Vision*—November 2001
- *Alumina Technology Roadmap*—November 2001
- *Aluminum Industry Technology Roadmap*—Revision currently in progress
- *Applications for Advanced Ceramics in Aluminum Production*—February 2001.

The Aluminum Association is partnering with Cornell University on the EERE R&D project Integrated Numerical Methods and Design



Recently updated Vision and Alumina Roadmap

The project results will be integrated into the aluminum design manual and should enable improved structural efficiency, which will result in significant energy savings.

Provisions for Aluminum Structures. The focus of this project is on developing numerical methods for structural analysis and design of complex aluminum structures. The project results will be integrated into the aluminum design manual and should enable improved structural efficiency, which will result in significant energy savings. The Association also partners on the aluminum scrap sorting and prevention of molten aluminum water explosions EERE R&D projects. These projects will lead to more economical scrap sorting and improved worker safety.

The Aluminum Association promotes EERE's goals through extensive dissemination of EERE products and information to its members and the public. Its Web site disseminates EERE program and project information. In addition, the Aluminum Association works with EERE to develop booklets and other materials relating to efficient energy use.



Founded in 1866, AMCAST is a major supplier of performance critical aluminum permanent-mold cast suspension components for the automotive industry. It also serves the construction industry and other industrial sectors.

In 2000, a plant-wide energy assessment was performed at AMCAST Industrial Corporation's Wapakoneta, Ohio, manufacturing facility by DOE's Office of Energy Efficiency and Renewable Energy BestPractices team. The assessment identified how saving energy can improve the bottom line. It resulted in 12 separate recommendations that would improve the efficiency of the plant's production process and decrease energy consumption. These 12 recommendations required an

The twelve recommendations that followed the Wapakoneta facility's plant wide assessment required an investment of \$1 million and will save up to \$3.6 million per year, resulting in a simple payback of just three months.



AMCAST staff install aluminum-titanate riser tube

investment of \$1 million and will save up to \$3.6 million per year, resulting in a simple payback of just three months. AMCAST was quick to begin implementation on several of the 12 recommended projects. Four are currently underway and one is complete. Some of the recommendations included simple tasks such as making improvements to electrical, lighting, motor drive, compressed air, and process heating systems. Implementation of these projects alone would result in a total annual savings of \$600,000.

The assessment found that a majority of the improvements to be made were in the manufacturing process. As a result of material modifications to process equipment, AMCAST will realize reductions in maintenance, scrap, downtime, and improve product quality. The total savings to AMCAST through making improvements to the manufacturing process would be an additional \$3 million. AMCAST is demonstrating to the industry the value and the importance of the industry government partnership, while at the same time improving the company's bottom line.

Playing a pivotal role in the steel industry's ongoing renewal and realizing its vision of the future, the AISI engages in a wide variety of collective and collaborative activities, such as those carried out with EERE.

**—Larry Kavanaugh
American Iron and Steel
Institute**

For over a century, North American steel producers have left their day-to-day rivalries behind to work as partners and members of the American Iron and Steel Institute (AISI), in furthering its mission to promote steel as the material of choice and to enhance the competitiveness of the North American steel industry. AISI's overall mission centers around common goals and a clear vision for the future:

- To provide high-quality, value-added products to a wide array of customers
- To produce steel in a safe and environmentally friendly manner
- To increase the market for North American steel in both traditional and innovative applications
- To lead the world in innovation and technology in the production of steel.

AISI engages in a wide range of collaborative research projects through a partnership with the Office of Energy Efficiency and Renewable Energy (EERE). As an EERE partner, AISI lends its industry expertise to EERE-sponsored studies focusing on improving energy efficiency, reducing emissions, and enhancing product properties. In 2001, AISI led the revision of the *Steel Industry Technology Roadmap*, a guide for identifying the technological advances needed to achieve steel's vision of the plant of the future. Results of this partnership help establish baseline data that will provide the foundation for future energy savings and productivity improvements to achieve these goals. Examples of EERE and AISI collaborative projects include:

Commercial Alternative to Chrome—Addressing a major environmental concern by finding a commercially acceptable alternative to chrome before the steel industry is required by regulation to do so.

Active Molten Metal Flow Control System—Working to implement active electromagnetic control of the flow of molten metal during manufacture. An electromagnetic control device could improve the quality of metal by reducing turbulence, reoxidation, and impurity entrapment in molten flow and increase overall yield, thus decreasing energy use. Projected benefits include: energy savings on the order of 2 x 1,012 Btu/year across the industry and savings of several dollars per ton, or possibly \$500 million/year, across the steel continuous casting industry.

Thermally Efficient Steel Stud—Developing a thermally efficient steel stud for energy-efficient residential and light commercial constructions. Projected benefit includes savings of 10 percent on heating costs.

API
is actively engaged in, and
supportive of, DOE's Industries of the
Future initiative—both in Utah and nation-
wide...collaborative efforts such as Industries
of the Future are important to developing some of
the technologies that will enhance our quality
of life in the 21st century.
—Red Cavaney
American Petroleum Institute

The American Petroleum Institute (API) is a national trade association representing more than 400 corporations involved in all aspects of the oil and gas industry. Among its many activities, API serves as a focal point for addressing oil and natural gas industry issues, including the R&D needs of its refineries through their semiannual Refining Meetings. API supports its public policy positions with scientific, technical, and economic research programs.

API's Technology Committee is charged with identifying the technical areas of greatest concern to the downstream industry and with developing technology strategies to address those concerns. The API Technology Committee, in cooperation with EERE, developed the *Technology Vision 2020—A Report on Technology and the Future of the U.S. Petroleum Industry*, and the *Technology Roadmap for the Petroleum Industry*. These documents focus on the research needed to strengthen the industry over the next two decades. The documents recognize that government-industry collaboration and effective use of the scientific capabilities of the national laboratory system can leverage scarce funds for research to ensure that technology advances are identified and adopted.

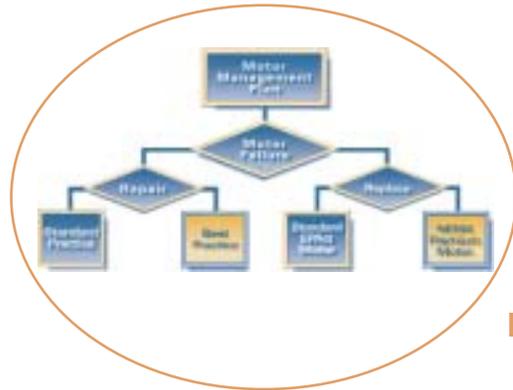
API is a partner with EERE on a number of R&D projects including: "Gas Imaging for Advanced Leak Detection," and "Rotary Phase Burner Technology." The gas imaging project provides accelerated and simplified leak detection by optical imaging of hydrocarbon plumes, while the rotary burner project reduces emissions of carbon dioxide and nitrogen oxides. Members of the API Technology Committee have reviewed EERE proposals and projects and will participate in the June 2002 portfolio review.

API is committed to improving the energy efficiency and economic competitiveness of the U.S. petroleum industry. API President Red Cavaney testified in the Congressional Forum at the EERE 2001 Utah Showcase and stated that "collaborative efforts such as Industries of the Future are important to developing some of the technologies that will enhance our quality of life in the 21st century."

Applied Proactive Technologies, Inc. (APT) provides energy efficiency programs to utilities and clients throughout the United States. We provide complete planning, managerial, implementation and evaluation services for conservation and load management, demand side management, energy efficiency, and market transformation programs.

The Motors division, headed by Program Director Bruce Benkhart, designed and ran the Southern California Edison Next Step Motor Program and currently runs the MotorUp Premium Efficiency Motor Initiative in New England, New Jersey, and Long Island, NY.

MotorUp promotes NEMA Premium™ efficient motors in the commercial and industrial sectors with rebates, DOE MotorMaster+ software and training, technical documents, newsletters, and other energy efficiency tools. MotorUp also gives Effective Motor



As an Allied Partner, APT relies heavily on the resources and expertise of OIT and the Best Practices program.

Management seminars focused on the benefits, energy savings, and life cycle costing of premium motors and quality repair.

MotorUp has helped implement NEMA Premium™ purchasing specifications for numerous companies including Anheuser-Busch, Crane Paper, Verizon, Suffolk County Water Authority, and many others. MotorUp has successfully encouraged motor manufacturers to develop NEMA Premium Efficient lines.

Mr. Benkhart sits on the Motor Decisions Matter (MDM) committee, which spearheaded the development of a Premium Efficient motor standard (NEMA Premium™) adopted nationally. MDM promotes motor management policy development nationally to upper level management at commercial and industrial companies.

As an Allied Partner, APT relies heavily on the resources and expertise of DOE's BestPractices program. As a result of that relationship, MotorUp had these successes in 2001:

- Distributed 440 MotorMaster+ 3.0 software CDs
- Gave 26 "Energy Savings Through Motor Management" seminars including MotorMaster+ training
- Trained more than 250 individuals on MotorMaster+ 3.0
- Distributed more than 100 DOE *Energy Management for Motor Driven Systems* booklets
- Electronically distributed more than 100 DOE technical documents.

MotorUp has resulted in approximately 3,600 MWh annual savings to the region, representing approximately 146,500 barrels of oil and over 100 million tons of carbon emissions avoided annually.

Established in 1990, the Association of State Energy Research and Technology Transfer Institutions, Inc. (ASERTTI) is a confederation of state and regional organizations with energy research and development and technology transfer responsibilities. ASERTTI members have a demonstrated track record of supporting high-impact R&D and applying the resulting new technologies in cooperation with utilities and other private and public organizations in their states. ASERTTI members, managing more than \$200 million in energy research annually, are major contributors to our nationwide energy research capabilities.

ASERTTI's goal is to increase the effectiveness of energy research efforts in contributing to energy security, environmental quality, and economic growth. ASERTTI does this by:

- Collaborating on research projects with state, federal, and private partners
- Sharing technical operation information among members and associates
- Speaking with one voice on energy R&D policy issues to national, state, and local decision-makers.

ASERTTI and its individual members have had a long, productive working relationship with DOE's Office of Energy Efficiency and Renewable Energy (EERE). This relationship was recently formalized in an Allied Partners Memorandum of Understanding (MOU), which is intended to promote communications and collaboration and leverage state and DOE energy research, development, demonstration and deployment (RDD&D) resources.

Participating in this MOU are ASERTTI, EERE, and the National Association of State Energy Officials (NASEO).

Representatives of the states that are members of ASERTTI and NASEO work together with EERE's representative to enhance communications between

EERE and the states. This team also identifies areas of mutual interest and develops collaborative energy RDD&D programs and projects.

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Augusta Newsprint's roots go back to 1965, when, as Cox Newsprint, it consisted of one paper machine and a groundwood mill. Today, the mill's facilities include two paper machines, a wood yard, a thermo-mechanical pulp (TMP) mill, a recycled newsprint mill, a bark boiler, utilities, and support areas. It employs 390 people and produces 1,200 tons of newsprint per day.

In May 2000, the Institute of Paper Science and Technology introduced Augusta Newsprint to EERE. EERE subsequently assisted mill management with assessing energy use and identifying energy-saving opportunities, plus sharing costs and providing technical assistance for improvements, helping Augusta save \$1.4 million and approximately 130 billion Btu per year.

The Augusta Newsprint Energy Showcase Event, held in March 2002, showcased some of the technologies that helped Augusta save energy and money, including:

Compressed Air—After doing a compressed air survey, management decided to increase system storage capacity, tie two mill systems together with improved controls, and repair leaks. These actions, which cost \$75,000, are saving the mill \$60,000 per year. "It showed us that, even though we're experienced, we were unaware of some important issues," said Chuck Amos, Augusta Newsprint's Engineering Manager.

TMP LD Transfer Pump Upgrade—This project involved removing a 10-inch control valve and installing a variable frequency drive. It required a \$15,000 investment, but will save the mill \$12,000 per year in energy costs on one pump.

#1 Paper Machine Fan Pump Motor Replacement—Augusta Newsprint replaced a 1,250-hp (900-rpm) motor with an 800-hp (720-rpm) motor. A total of 500 hp is being saved; the mill invested \$123,000 on this project and will save \$93,500 per year in energy costs.

Advanced Quality Control Project—This project aims to improve TMP quality. After investing \$1.4 million, the AQC project is expected to save Augusta Newsprint \$1.12 million per year and reduce consumption of kraft pulp by 2,000 metric tons. Furthermore, energy use may be cut by 7,200 MWh per year.

EERE assisted mill management with assessing energy use and identifying savings opportunities, shared costs, and provided technical assistance.



New 10,000-gallon compressed air storage tank



Boise Cascade

Boise Cascade has a long history of energy management policies aimed at eliminating waste, minimizing consumption, and maximizing self-generation. Over the years, the company has advanced these goals through collaborative efforts with the Office of Energy Efficiency and Renewable Energy (EERE), national laboratories, and other visionary organizations. Today, Boise Cascade generates 54 percent of its energy needs from renewable resources.

In 2000, Boise Cascade won a prestigious American Forest and Paper Association Annual Environmental and Energy Achievement Award for demonstrating Methane DeNOx, a technology that improves wood-fired boiler efficiency while reducing emissions. In 2001, the company followed up with investigations to utilize this same technology at other locations and currently plans to implement a modified version at its DeRidder, Louisiana, paper mill. Boise Cascade is also working toward demonstration of an advanced gasification power generation process along with other EERE emerging technologies.

Boise Cascade is a strong supporter of plant-wide assessments. All five of its fully integrated pulp and paper facilities have been modeled and audited. A follow-up case study was completed in 2001, for one such project at the International Falls, Minnesota, paper mill, that was done in cooperation with Oak Ridge National Laboratory. The company estimates saving 45 MMBtu/hr from six successfully implemented projects and process modifications, and is presently investigating similar approaches at other facilities.

Progress is also being made in less energy intensive divisions throughout the company. The container and wood products facilities have benefited from case studies presented on the EERE Web page. Several plants have completed compressed air studies and many more are working on lessons learned from participation in EERE BestPractices for Steam. One of Boise Cascade's plywood plants performed upgrades on a wood-fired boiler that reduced emissions and decreased natural gas consumption by 46 percent.

In addition to optimization studies and technology demonstrations, Boise Cascade is actively involved in the development and review of its industry strategy and business plan. In 2001, the company participated in industry merit and program reviews, technology roadmapping, and planning for the Washington State Industries of the Future event to be held in April 2002. It anticipates continued joint success from participation in IOF programs.

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Cargill Dow

Cargill Dow LLC has received much acclaim for the development of polylactic acid (PLA), a novel polymer made from annually renewable resources. PLA is the first commercially viable, biobased polymer that offers performance equal to or greater than traditional polymers while being fully compostable in industrial and municipal composting facilities. The success of PLA sparked an outpouring of industrial recognition in 2001 led by *Industry Week's* Top Technology of the Year for 2000 and *Popular Mechanics's* 2001 Design and Engineering Award. These were followed by the U. S. Department of Energy Office of Energy Efficiency and Renewable Energy's Technology-of-the-Year Award and recognition of Dr. Pat Gruber, vice president and chief technology officer of Cargill Dow, for his work on PLA with the Discover Award for Environmental Innovation.

As a strong, outspoken advocate for biobased products and bioenergy, Cargill Dow has been a valuable partner of the Office of Energy Efficiency and Renewable Energy's Agriculture Industry of the Future (IOF) and the Federal Interagency Biobased Products and Bioenergy Initiative. They are currently collaborating on three Agriculture IOF projects and a biomass refinery project funded by the Office of Energy Efficiency and Renewable Energy. Cargill Dow has also been active in the effort to create a Biobased Products and Bioenergy Industry Vision and Roadmap.

In November 2001, Cargill Dow began PLA production at its new plant in Blair, Nebraska, which has a capacity of its more than 300 million pounds per year. Initially used in textile, fiber, and film



Cargill Dow's PLA plant in Blair, Nebraska

DOE has been a key organization in the development of the technology behind NatureWorks™ PLA. With assistance from this organization, and others, Cargill Dow was able to bring the technology to market sooner.
—Dr. Pat Gruber
Cargill Dow

packaging applications, the PLA market is expected to expand with the development of new applications to approximately 8 billion pounds per year by 2020, with a potential annual fossil energy savings of 210 trillion Btu.

The Cast Metals Coalition (CMC) facilitates DOE's partnership with industry in the Metal Casting Industry of the Future (IOF) program. The CMC is comprised of the Steel Founders' Society of America (SFSA), American Foundry Society (AFS), North American Die Casting Association (NADCA), and the Advanced Technology Institute (ATI). AFS, NADCA, and SFSA are the leading technical societies for the industry and collectively represent the majority of U.S. metal casters. ATI, a leading technology organization, provides management support on CMC activities and is involved in all stages of the partnership.

The CMC is an outstanding partner, enthusiastically supporting all aspects of the partnership from the original Metal Casting Compact, Vision, and Roadmap to successfully implementing research and development (R&D) and disseminating results to industry. CMC

continues to provide leadership as it renews its Compact with DOE and updates its Vision and Roadmap. The CMC provides technical oversight on metal casting R&D.

CMC members provide outreach and dissemination of R&D results to the industry through conferences, seminars, Web sites, and trade journals. They actively communicate opportunities available from DOE technical and financial assistance programs, demonstrated by metal casting industry participation in BestPractices, NICE3, Inventions and Innovation, and State IOF.

Since the beginning of its partnership with DOE, CMC has helped to implement and manage nearly 100 R&D projects involving dozens of universities and laboratories, more than 300 industry partners and hundreds of students. CMC has consistently participated in biennial DOE Energy Efficiency Expos, Customer Day, and other events. CMC has sponsored showcases to demonstrate the tangible difference that DOE research is making in the metal casting industry. It facilitates advances in innovative casting techniques such as lost foam, and disseminates R&D results including casting guidelines, design tools, energy manuals, and mechanical properties data to reduce energy consumption and simultaneously produce higher quality castings. It is currently sponsoring a benchmarking study on energy use in the industry to identify new opportunities for saving energy and measuring progress.



Technology poster-board used for Chevron Tour

At the August 2001 event, Chevron showcased five different technologies and best practices.

The Chevron refinery in North Salt Lake was built in 1948, and it is the largest marketer of gasoline in Utah. The Chevron refinery produces a variety of finished products including fuels, finished lubricants, base oils, process oils, and fuel additives. The refinery was one of three Office of Energy Efficiency and Renewable Energy (EERE) Showcase refineries to allow industry experts, researchers, colleagues, and EERE staff to learn first-hand about the technologies that are reducing costs and improving the efficiency of refinery operations. The participants exchanged ideas that will encourage attendees to adapt innovations in their own facilities.

Chevron showcased five different technologies and best practices at the August 2001 event. They included an improved compressor system configuration, enhanced steam system management, better pipe insulation using EERE's *3E Plus* software, and an effective statistical analysis and tracking program for oxygen in refinery furnaces and boilers. Chevron also broke new ground with an analysis of air pollutants emitted through combustion of refinery fuel gas. The analysis found that the fuel gas emissions were essentially the same as the emissions from natural gas. The benefits of these technologies and of Chevron's work with EERE include reduced electricity usage, reduced use of water treatment chemicals, reduced consumption of fuel gas, operating cost savings, and savings on capital expenditures for pollution abatement and control.





Commonwealth's Showcase will feature plant tours

Commonwealth Aluminum will host an EERE Showcase at its facility in the city of Uhrichsville, Ohio, in September 2002.

Commonwealth Aluminum is one of North America's leading manufacturers of aluminum sheet and tubing. Commonwealth Aluminum has unmatched cost-efficiency and manufacturing flexibility. The company manufactures more than 3,800 variations of aluminum sheet and tubing products in accordance to exacting customer specifications. Its production exceeds one billion pounds of aluminum products. These products are sold to distributors and end-users, principally for use in building and construction products such as roofing, siding, windows, and gutters; transportation equipment such as truck trailers and bodies and automotive parts; and consumer durables such as cookware, appliances, and lawn furniture.

Commonwealth Aluminum has helped establish a history of collaboration with DOE's Office of Energy Efficiency and Renewable Energy (EERE) as a charter member of the aluminum research consortium, Secat, Incorporated. Commonwealth participates in six EERE Aluminum cost-shared R&D projects that address industry-defined priorities as well as national goals for energy and the environment. Projects include isothermal melting, reduction of oxidative melt loss, evaluation and characterization of in-line annealed continuous cast sheet, modeling optimization of direct chill casting to reduce ingot cracking, and structural factors affecting formability of continuous cast aluminum.

Commonwealth Aluminum will host an EERE Showcase at its Uhrichsville, Ohio, facility in September 2002. The Showcase is a public event designed to highlight the benefits of adopting new energy efficiency and resource productivity technologies. The Showcase allows the public to view technologies applied in real-use conditions in a manufacturing environment.

Commonwealth Aluminum is currently conducting an EERE plant-wide assessment. It is assessing two aluminum sheet production operations (chill casting and continuous casting) at its Uhrichsville facility and providing direct comparisons of energy requirements and future savings opportunities for the different process technologies. Commonwealth hosted BestPractices training sessions in March 2002 at the Uhrichsville facility.

The Compressed Air & Gas Institute (CAGI), a trade association of manufacturers of compressed air systems equipment, joined with the U. S. Department of Energy in 1996 to improve the effectiveness and efficiency of compressed air systems. The Institute is focusing on education and training of users and purchasers of compressed air systems.

As part of its training and education initiative, CAGI has participated as a founding member of the Compressed Air Challenge in developing two training courses, *Fundamentals of Compressed Air Systems* and *Advanced Management of Compressed Air Systems*. The recommendations and knowledge provided in these courses will help users reduce the cost of operating their compressed air systems while simultaneously improving the performance of those systems. CAGI plans to offer this training opportunity in 16 cities throughout the country this fall.

The Compressed Air & Gas Institute joined with DOE to improve both the efficiency and effectiveness of compressed air systems.

The institute has also developed a series of videos as a resource about compressed air systems. CAGI and DOE cooperated on the latest installment in the series, *How to Select an Air Compressor*, which helps buyers identify the items that will affect their decision.

The video shows how approaching the purchase of a compressor with the entire system in mind, and using life cycle costs to analyze the many available choices, will allow purchasers to minimize overall cost and maximize performance of their systems.

To fulfill its mission of delivering information to users and purchasers, CAGI has created a standardized format for reporting performance. CAGI members have agreed to supply performance data on the standardized data sheets upon request. The members of CAGI have been determining performance according to recognized international standards for many years, and the standardized forms will clarify the data for easier comparison.



A little known benefit to the formation of the Compressed Air Challenge in 1998 was the idea that compressed air equipment distributors had a vested interest in working together as a single voice to make U.S. industry more competitive in a world market. The Compressor Distributor Association (CDA) was formed to share the expenses of becoming one of the original program sponsors. The CDA is an association of associations representing over 600 independent businesses across North America.

Historically very fierce competitors, the notion that representatives of the Gardner Denver, Quincy, Sullair, CompAir and Atlas-Copco equipment distributors could meet in the same room would be followed by jokes about a 911 phone call to the local authorities. Acronyms identify most of the syndicate families: Gardner Denver Distributors are represented by the ICDA (Industrial Compressor Distributor Association), the Quincy Distributors group is the AICD (Association of Independent Compressor Distributors), Sullair members are represented by their Distributor Council, CompAir members are represented by the NAACD (North American Association of Compressor Distributors) and the Atlas Copco members are represented by the ACIDA (Atlas Copco Industrial Distributors Association). The organization is successful in its third year.

In early 2000, as part of its Allied Partner agreement with DOE, the CDA agreed to organize a program that combined fundamentals and advanced compressed air training for its member and industry representatives. CDA members from all five associations were

assigned host duties for each of ten training sites.

Between September 27 and December 7, 2000, 638 people attended a two-and-a-half-day training program. The training sites were Atlanta, Baltimore, Boston, Chicago, Denver, Louisville, Milwaukee, Newark, San Francisco and St. Louis.

The training was co-sponsored by DOE and Advisory Board Utilities. More than 30 distributors agreed to become Allied Partners in response to an invitation issued by the CDA as part of the CDA/DOE training partnership.

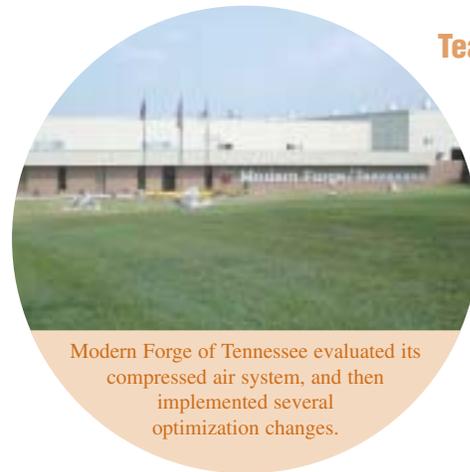
A little known benefit to the formation of the Compressed Air Challenge in 1998, was an idea that, compressed air equipment distributors as a technical resource, could contribute to and had a vested interest in working together as single voice to make U.S. industry more competitive in a world market.

Established in 1987 to help manufacturers use compressed air more efficiently, ConservAIR Technologies Company, LLP develops products and application technologies to improve the performance of industrial compressed air systems. At the inception of the Compressed Air Challenge (a group that EERE also participates in), ConservAIR recognized the need to actively participate in the process.

Teaming with DOE, ConservAIR has shared the knowledge and experience gained over a decade to save industry millions of dollars in energy costs. EERE has completed three studies utilizing ConservAIR application technologies with annual savings reported: Caterpillar Fuel Systems 5,280,000 kWh (\$226,000/year); Sanmina Corporation 742,000 kWh (\$63,000/year); and Modern Forge 2,400,000 kWh (\$120,000/year).

Tom Taranto and Bob Wilson of ConservAIR are Qualified *AIRMaster+* Specialists and have contributed extensively to the *AIRMaster+* training curriculum. Tom is also a Qualified *AIRMaster+* Instructor and was involved in formulating the exam. Both are Compressed Air Fundamentals Training Instructors for CAC, and Tom is qualified to conduct the Advanced Management Training for Compressed Air.

Joe Fresch of ConservAIR served as President of Compressed Air Challenge, Inc., in its first year as a corporation. ConservAIR has co-sponsored several CAC training sessions and recently participated in a DOE industrial energy event conference in Sacramento, California. ConservAIR works with its distributors to promote the various DOE initiatives and disseminate information, including the recently published EERE *Assessment of the Market for Compressed Air Efficiency Services*. ConservAIR is committed to working in partnership with DOE and EERE to establish standards for the compressed air industry and implementing its BestPractices Program.



Modern Forge of Tennessee evaluated its compressed air system, and then implemented several optimization changes.

Teaming with EERE, ConservAIR has shared the knowledge and experience gained over a decade to save millions of dollars in energy costs.



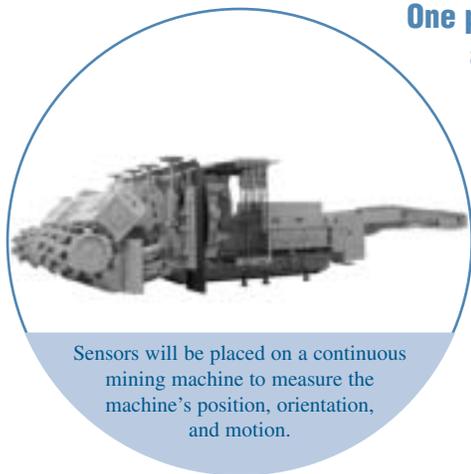
CONSOL Energy Inc. is among the nation's top energy companies, producing coal and natural gas. CONSOL Energy mines more high-Btu bituminous coal than any other producer in the United States and is one of the largest U.S. producers of coalbed methane. CONSOL Energy's Research & Development Department is a private research organization devoted to energy production and use. With an annual R&D budget of \$7 million, CONSOL Energy performs research to enhance safety, improve productivity, control emissions and by-products, and improve efficiency in energy production and use.

Led by the efforts of Frank Burke, vice president for Research and Development, CONSOL Energy has been a champion for the Mining Industry of the Future (IOF) since the inception of the program. CONSOL Energy has provided leadership and technical expertise in all aspects of Mining Industries of the Future (IOF) implementation. CONSOL Energy has:

- Provided industry perspective and technical expertise in developing the Mining IOF Vision and three subsequent Mining IOF Technology Roadmaps
- Participated in EERE's Mining IOF Annual Portfolio Reviews and sponsored an independent project review to evaluate promising mining technologies
- Championed the State IOF strategy and is currently working with industry and government leaders in West Virginia to translate the benefits of the IOF strategy to companies in the state.

Most importantly, CONSOL Energy is contributing its R&D expertise to improve energy efficiency and competitiveness in U.S. mining. This includes R&D on advanced sensors to perform real-time stress measurement as well as technologies to perform imaging ahead of mining. These technologies will significantly reduce excavation requirements in mining, resulting in significant improvements in mine safety as well as reduced energy requirements. On one project alone, development of an advanced sensor to improve the machine's ability to measure and analyze mineral seams will save an estimated 6.4 trillion Btu per year by 2020.

CONSOL Energy is assisting in technology transfer of R&D results through participation in industry meetings and a wide range of other activities.



Sensors will be placed on a continuous mining machine to measure the machine's position, orientation, and motion.

One project alone, an advanced sensor to improve the ability to measure and analyze mineral seams, will save an estimated 6.4 trillion Btu per year by 2020.



Multi-national Delphi Corporation is a world leader in mobile electronics and transportation components and systems technology. Headquartered in Troy, Michigan, Delphi's three business sectors—Dynamics and Propulsion; Safety, Thermal and Electrical Architecture; and Electronics and Mobile Communication—provide comprehensive production solutions for its customers.

Delphi has a long history of partnering with DOE's Office of Energy Efficiency and Renewable Energy (EERE). Delphi and EERE signed an initial cooperative research and development agreement in 1992 for Delphi to apply nickel aluminide alloys, including alloy development, welding, melting, and casting technologies in its manufacturing facilities. The new alloy enables a more energy-efficient manufacturing process not only for Delphi, but also for other U.S. manufacturers with similar needs.

More recently, Delphi engineers worked with the Oak Ridge National Laboratory, the inventors of the alloy, to apply the material in their heat treating facilities, changing more than 500 fixtures used in their carburizing furnaces. Carburizing furnaces are very large gas-fired systems that heat treat many tons of steel per day. The nickel aluminide fixtures last 3-5 times longer than current high performance steel alloys, and are at least three times stronger at operating temperatures than conventional alloys. These properties enable improved energy and production efficiencies of up to 33 percent.

Delphi has a long history of partnering with DOE's Office of Energy Efficiency and Renewable Energy (EERE). Delphi and EERE signed an initial cooperative research and development agreement in 1992 for Delphi to apply nickel aluminide alloys, including alloy development, welding, melting, and casting technologies in its manufacturing facilities.

Delphi's plant in Saginaw, Michigan, was the site of a Success event to highlight the commercialization and use of nickel aluminide fixtures in its heat treating furnaces.

Delphi also participates in the Green Power Market Development Group, which is developing strategies to reduce green power costs, reduce market barriers, and help articulate the business case for green energy use including wind, solar, landfill gas, and fuel cells.

The Dow Chemical Company is a leading provider of chemical, plastic, and agricultural products and services to essential markets such as food, transportation, health and medicine, personal and home care, and building and construction. As a leader in innovation and development, Dow collaborates with the Office of Energy Efficiency and Renewable Energy (EERE) Agriculture and Chemicals Industries of the Future program. Dow's activities include participation on the Vision2020 steering committee, the Vision2020 Chemicals Plus project, the Vision 2020 Challenge initiative, and the Technical Advisory Committee for the Biobased Products and Bioenergy Initiative.



Castor Seed Pods

The Dow Chemical Company is a leading partner with DOE's Office of Energy Efficiency and Renewable Energy in both the agriculture and chemical sectors.

The company represented cross-cutting engineering science from the chemical industry at the Utah 2001 Industry Showcase and chairs the Texas Industry of the Future Technology Showcase steering committee. Dow has also joined with EERE in organizing a consortium of ten companies, seven universities, and six national laboratories researching multi-phase fluid dynamics.

Dow is the lead partner on one of EERE's new biobased products projects that integrate the biobased product value chain from plant science and crop production through processing and product utilization. Dow also volunteered to play a leadership role and co-moderate the Agriculture IOF-sponsored workshop on plant sciences recently held in Chicago.

Dow collaborates with EERE on several ongoing partnership projects:

- Corrosion Prediction in Mixed Solvents
- Solution Crystallization Tools
- Distillation Column Modeling Tools
- Improved Chemicals and Plastics from Oilseeds.

The company has also improved its manufacturing operations with seven new cogeneration power facilities since 1994. The combined facilities have replaced less efficient energy generating facilities, reducing energy usage by approximately 23 trillion Btu per year and eliminating approximately 1.2 million metric tons of CO₂ emissions.

With more than 40 R&D and customer service labs in the United States and 35 in 11 other countries, DuPont is dedicated to innovation. An important aspect of that is research partnerships such as our projects with EERE.

**—John Carberry
DuPont**

Two hundred years after its inception, DuPont is a global leader in science-based solutions in food and nutrition, health care, apparel, home and construction, electronics, and transportation. DuPont is an active partner with the Office of Energy Efficiency and Renewable Energy (EERE), heading two Vision2020 projects—direct capture of products and biomass to energy. DuPont also leads development of American Institute of Chemical Engineers (AIChE) and EERE energy metrics and benchmarks, supports technology roadmap development, and participates on the Vision2020 steering committee. DuPont also collaborates with EERE in several research partnerships:

- Corrosion Prediction in Mixed Solvents—Helps to develop software to predict alloy corrosion in organic and mixed-solvent solutions. Projected benefits include estimated energy savings of 33 million Btu/year per unit installed and elimination of shutdowns associated with overly complicated equipment.
- Molecular Simulation—Developing software tools with molecular modeling capabilities for design of improved membrane separation techniques. Projected benefits include elimination of certain steam-driven chemical separations and significantly reduced separation energy use.
- Resistance to Metal Dusting—Collaborating with a host of partners researching materials resistant to corrosion associated with metal dusting in the high-temperature, high-carbon environments prevalent in many chemical and petrochemical processes. Projected benefits include operational savings of \$50,000/year per plant and savings of \$200-290 million/year in the hydrogen industry.
- Computational Chemistry and Reaction Engineering Workbench—Developing a suite of graphical user interface modeling software that will replace the array of complicated, often unused chemical modeling tools existing today. Projected benefits include improved design of chemical processes and processing equipment and increased energy savings and efficiency.





Emerson Motor Technologies has made it a primary mission to seek out and participate in energy efficiency programs.

As a charter partner of the DOE Motor Challenge program in 1993, and a recent sponsor of the Motor Decisions Matter campaign, Emerson Motor Technologies has long understood the value of advancing industrial energy efficiency, and partnering with EERE to help make its energy efficiency goals a reality.

Emerson Motor Technologies has made it a primary mission to seek out and participate in energy efficiency programs that make business sense to the motor industry, and economic sense to its customers. By looking at factory operations as a whole, instead of one motor at a time, Emerson Motor Technologies is helping its customers identify real energy reducing solutions and process improvements.

This major focus is driving Emerson Motor Technologies' present and future energy efficiency efforts. It is through previous involvement in energy programs that Emerson Motor Technologies has gained insights that help Emerson move forward with new premium motor programs.

In 1989, Emerson Motor Technologies became an original founder of EERE's Motor Challenge program, later renamed BestPractices. The program focused on energy efficiency within an entire motor system, looking at each element of a motor system, such as the motors, drives, controls and pumps, rather than just the motor.

Emerson Motor Technologies continued its dedication to energy efficiency in 1997 by becoming one of the first motor manufacturers to conform to the federal Energy Policy Act (EPAAct), which set the standards for energy efficient motors.

In June 2001, Emerson Motor Technologies introduced its line of NEMA Premium™ motors. The extensive line of industrial, commercial, and HVAC motors meet or exceed the new National Electrical Manufacturers Association premium efficiency standards—the most comprehensive in the industry.

In 2001, Emerson Motor Technologies also became a sponsor of the nationwide Motor Decisions Matter (MDM) campaign, which promotes sound motor management and the use of NEMA Premium™ motors. The campaign has 29 sponsors, which also include DOE and the U.S. Environmental Protection Agency.



The Energy Center of Wisconsin is the leading Wisconsin organization providing objective research, information, and education on energy issues to businesses, professionals, and policymakers. To fulfill this mission, the Energy Center manages programs to help industry, hosts educational workshops, and makes information available through its Web site. The Energy Center is a private, non-profit organization.

As an Allied Partner, the Energy Center of Wisconsin works with DOE to raise awareness of energy efficient technologies and practices for industry by leveraging the DOE's Industries of the Future strategy and BestPractices. For example, the Energy Center is working with the state's metal casters to adopt the DOE Metal Casting Roadmap and



Wisconsin metal casters discuss DOE's Metal Casting Roadmap

We leverage EERE's industrial programs for Wisconsin. Our success is market proof that EERE does valuable work.

**—Kevin Grabner
Senior Project**

Manager, Energy Center of Wisconsin

pursue priority projects. It recently developed a roadmap for Wisconsin papermakers, and now facilitates action teams working to accelerate deployment of advanced papermaking technologies.

In 2001, the Energy Center of Wisconsin was selected to design and manage an expanded Wisconsin Industries of the Future Program for seven industries, funded by \$2.3 million of state public benefits charge money.

Other recent collaborative activities include:

- Hosting training in the advanced management of compressed air systems and a session in specialist training for DOE's AirMaster+ software. The Energy Center is very active in Compressed Air Challenge (in which DOE also participates).
- Providing a series of one-day steam training workshops.
- Facilitating Industries of the Future roundtable discussions for the Wisconsin printing, agricultural biotechnology, food processing, and plastics industries.
- Managing events such as the Annual Governor's Business Roundtable on Energy and the Environment that promote EERE programs, products, and services.
- Creating new curricula modeled on DOE's BestPractices, including Industrial Energy Management, Ammonia Refrigeration, and Industrial Process Controls.



Energy Research Company (ERCo) has successfully partnered with DOE's Office of Energy Efficiency and Renewable Energy (EERE), industry, and state agencies to develop and provide innovative technologies and services for industry's use. These projects have resulted in actual energy savings of 62,000 million Btu per year and aluminum production increases of 46 million pounds per year. In addition, projects under development and further deployment of existing technologies will provide additional benefits. ERCo has achieved its first commercial success with 14 scrap decoaters (NICE³ Project) sold throughout the world. Other projects are on the verge of commercial introduction. ERCo has participated in the following EERE programs:

National Industrial Competitiveness Through Energy, Environment and Economics (NICE³)

- Demonstrated a decoating kiln now being commercially sold. It meets EPA standards and reduces energy use by 24 percent
- Developed corrosion resistant coatings for recuperators. A pilot-scale test was successfully completed and a full-scale demonstration is underway.

Inventions and Innovation (I&I)

- Inert anodes for the primary aluminum industry are being developed. These replace the traditional carbon anodes thus reducing energy use by 25 percent and eliminating greenhouse gas emissions.
- Started initial development of Laser Induced Breakdown Spectroscopy (LIBS) work.



ERCo's innovative Vertical Flotation Melter Furnace

Energy Research Company has successfully partnered with EERE, industry, and state agencies to develop and provide innovative technologies and services for industry's use.

Sensors and Controls

- Continued developing and testing an LIBS probe.

Aluminum

- Pilot-tested a Vertical Flotation Melter (VFM) and decoater for the aluminum industry that reduces energy by 60 percent.
- Applied the LIBS technology for in-situ, real-time measurement of melt constituents.

Glass

- The LIBS technology was also adapted for measuring glass feedstocks and identifying cullet contaminants and cullet color.

Plant Assessments

- Participated in plant assessments at Crucible Specialty Metals, Charter Steel, Utica Corporation, and Metlab.

For over a century, Fairbanks Morse has been manufacturing a wide range of pumps for applications in public works and industrial installations. The Fairbanks Morse manufacturing facility provides advanced engineering and technology, a major testing facility for product performance evaluation, and computerized machining centers for high-quality manufacturing techniques. Fairbanks Morse sales and service facilities are located across the United States and throughout the world.

As a DOE Allied Partner, Fairbanks Morse works with its customers to reduce energy consumption. Arnie Sdano, Director of Engineering for Fairbanks Morse, is involved in a number of activities with DOE. Through his involvement in the Hydraulic Institute's (HI) Education Committee, he was able to guide the development of the Energy Reduction video program developed by HI and sponsored by DOE.

When DOE initiated its program to qualify instructors in the use of its *Pumping System Assessment Tool* (PSAT) software tool, Arnie was the first DOE qualified instructor. He uses PSAT as part of his own presentations to pump users.

Fairbanks Morse has sponsored several training sessions in Virginia and Texas on pump energy reduction where the focus was on the use of PSAT. Through these sessions approximately 300 people have been trained in the use of PSAT and were provided with DOE's *Decision Tools Software* CD. This type of training is an exemplary model of partnering that helps to leverage limited resources and facilitates the dissemination of important energy efficiency materials to industry.

Furthering its commitment to energy reduction for its customers, Fairbanks Morse has also developed a graphical method of selecting pump control set points that allow for the efficient application of variable speed pumps.

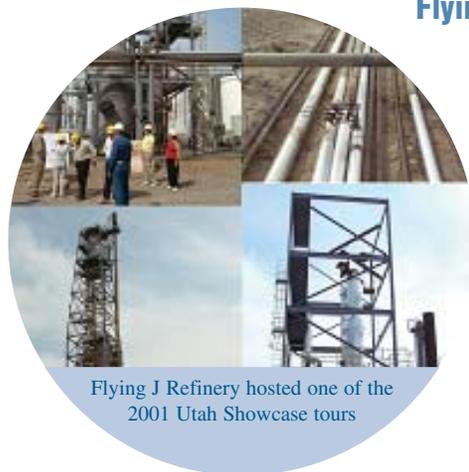
Fairbanks Morse has sponsored several training sessions in Virginia and Texas on pump energy reduction where the focus was on the use of PSAT.

Flying J converts approximately 25,000 barrels per day of crude oil, natural gas liquids, and other feedstocks into diesel fuel, propane, gasoline, jet fuel, and specialty wax. The refinery has made great strides in keeping pace with advancing technology.

Flying J has demonstrated its commitment to improving process efficiency by making new capital investments in equipment and advanced process control and by participating in Office of Energy Efficiency and Renewable Energy (EERE) BestPractices activities and energy assessments. It was the first Utah refinery to agree to act as a Showcase host and to open its gates to display what can be accomplished when government and industry work together. The on-site tour enabled Showcase attendees to view the new energy-saving, environmentally friendly technologies that Flying J has implemented. Learning first-hand about these new innovations and exchanging ideas with industry experts, researchers, colleagues, and EERE staff encouraged attendees to adapt these innovations in their own facilities.

Flying J's readiness to adopt new technologies and willingness to open its facilities says volumes about Utah's attitude toward business innovation, its concern for industry, and its understanding of the nation's energy needs and resources. The refinery was instrumental in obtaining the participation of the Utah Congressional delegation for a field hearing. Flying J also participated in the briefing for high school students on professional careers in the refinery industry.

Flying J highlighted six different applied technologies and best practices at the Showcase. Together these technologies have resulted in increased liquid volume yield of approximately 4 percent, reduced energy consumption of 53 billion Btu per year, reduced costs by more than \$320,000 per year, reduced carbon dioxide emissions by more than 4,600 tons per year, reduced SOx emissions of almost 6,400 pounds per year, reduced NOx emissions by more than 11,300 pounds per year, and reduced fugitive emissions of VOCs of 10-12 tons per year.



Flying J Refinery hosted one of the 2001 Utah Showcase tours

Flying J was the first Utah refinery to agree to act as a Showcase host and open its gates to display what can be accomplished when government and industry work together.



The FMC Corporation is a focused chemical company supplying the agricultural, specialty, and industrial chemical markets. Utilizing advanced technologies and customer-specific R&D, FMC provides solutions to food and agricultural, pharmaceutical, pulp and paper, textile, glass and ceramic, rubber and plastic, lubricant, structural pest control, turf and ornamental, specialty, and other related industries.

In August 2001, three divisions of FMC's Industrial Chemicals Group formed the first end-user Allied Partnership with the Office of Energy Efficiency and Renewable Energy (EERE). FMC Alkali Chemicals is the world's largest producer of natural soda ash and the market leader in North America, also producing sodium bicarbonate, sodium cyanide, sodium sesquicarbonate, and caustic soda. FMC Hydrogen Peroxide is a worldwide producer of hydrogen peroxide with manufacturing sites in the United States, Canada, Mexico, Spain, the Netherlands, and Thailand. FMC Active Oxidants is the world's leading supplier of persulfate products and a major producer of peracetic acid and other specialty oxidants.

FMC focuses heavily on improving resource efficiency, using site energy reduction teams and energy-focused interdivisional technology support teams in the company's energy conservation efforts. As an EERE Allied Partner, FMC reviews the entire R&D project portfolio for opportunities to participate in the development and application of promising technologies. The company engages in plant energy site surveys and enrolls its employees in EERE BestPractices training to improve the energy efficiency of its operations. The company also

incorporates EERE products, tools, and services into its operations and promotes the use of those tools and strategies within the chemical industry. The FMC Allied Partnership with EERE focuses on the following initiatives:

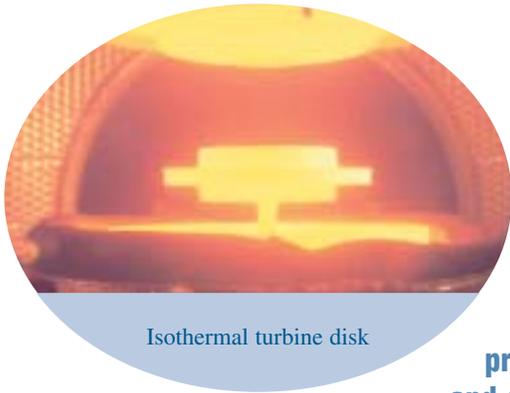
- Disseminating information on EERE and its resources
- Conducting energy assessments at multiple facilities
- Providing training workshops on energy efficiency
- Participating in Texas Industries of the Future activities
- Evaluating opportunities to implement emerging technologies.

The strong market positions held by our Alkali Chemicals, Hydrogen Peroxide, and Active Oxidants divisions are largely the result of innovative process technologies such as those developed through our partnership with EERE.
—Brian Wimer
FMC Corporation



The Forging Industry Association (FIA) provides its members with management, marketing, engineering, environment and safety, and regulatory assistance services. Its outreach programs include assistance to end-use customers, taking part in trade shows, and acquainting students at the university level with the forging process and production. FIA committees conduct conferences and seminars to assist members in the total operation of their organizations. FIA hosts Web-based interactive educational courses on forging technology and company management. Its Web site provides important information about the forging process, the North American forging industry, and the producers of forged products. The Forging Industry Educational and Research Foundation is a supporting organization that promotes formal education and scientific research.

The Forging Industry Vision and Technology Roadmap established the strategy to improve energy efficiency, productivity, product quality, and environmental performance.

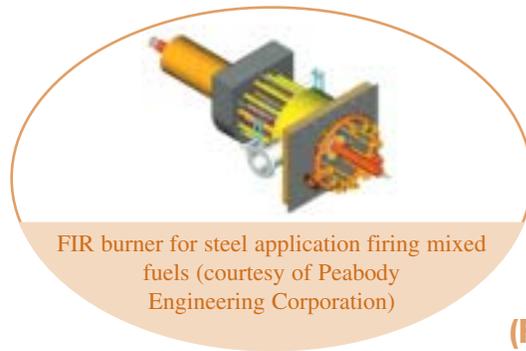


Isothermal turbine disk

Through cooperative efforts with DOE's Office of Energy Efficiency and Renewable Energy (EERE), FIA has provided the leadership needed for the development and distribution of the Forging Industry Vision and Technology Roadmap. This roadmap established the strategy to ensure the forging industry's growth in the world markets, through improvements in its energy efficiency, productivity, product quality, and environmental performance.

Since 2000, the successes that have resulted from the FIA-EERE partnerships for implementing the forging industry TRP, have included: (1) Formation of Center for Excellence in Forging Technology at Ohio State University; (2) Development of an Infrared Heating System for Dies and Billets; (3) Defense Logistics Agency Forging Initiative to significantly reduce lead time and component cost (4) System for the Non-Contact Dimensional Inspection of Elevated Temperature Parts which accurately predicts Room Temperature Dimensions; (5) Galvanneal Temperature Measurement System; (6) Development of Replacement for Phosphate Coating Lubes; (7) Formation of a Precision Forging Consortium; and (8) three EERE plant-wide assessment awards.

To leverage resources, FIA formed a Joint Industry Alliance with the American Iron and Steel Institute and the ASM Heat Treatment Society, with Oak Ridge and Sandia National Laboratories as the key technical partners.



FIR burner for steel application firing mixed fuels (courtesy of Peabody Engineering Corporation)

A GTI-DOE partnership with Peabody Engineering to demonstrate a Forced Internal Recirculation (FIR) burner for applications firing mixtures of natural gas, coke oven, and blast furnace gases.

In 2001, the Gas Technology Institute (GTI) and the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE) continued their partnership toward advancing energy-efficient technologies for industry.

Selected project highlights include:

- A two-day Industrial Natural Gas Vision and Technology Roadmap workshop hosted by GTI. The 50 attendees included industrial end-users, Southern California Gas Company, manufacturers, and researchers. Participants identified research, development, and demonstration needs related to more efficient uses of natural gas and began development of a vision and roadmap document that will serve as a planning tool for both industry and government. GTI is coordinating the effort, supported by the American Gas Association and the Industrial Center, in cooperation with DOE.
- A GTI-DOE partnership with Peabody Engineering Corporation to demonstrate a Forced Internal Recirculation (FIR) burner for applications firing mixtures of natural gas, coke oven, and blast furnace gases. Developed with GTI, DOE, and gas industry support, the FIR burner has achieved less than 10 ppmv NOx with natural gas in watertube boilers without external flue gas recirculation (FGR). External FGR requires parasitic (fan) energy and degrades boiler thermal efficiency. GTI licensed Johnston Boiler Company and COEN for different applications.
- Testing and evaluations of the METHANE de-NOX® process for environmental and energy efficiency benefits in wood waste and sludge-fired stoker boilers used extensively in the paper and forest products industry. Results of earlier testing at a boiler in Minnesota documented 50-70 percent NOx reductions and boiler efficiency improvement of between 1-2 percent. GTI and its commercial partners are seeing significant industry interest in the technology.
- Field trials on oxy/gas burners at glass furnaces that provided positive preliminary data that a High Luminosity Burner could provide increased energy efficiency and reduced NOx emissions. Commercial introduction by Combustion Tec is anticipated in 2002.



GMIC Executive Director,
Michael Greenman

The collaboration between GMIC and EERE has achieved the completion of the Glass Industry Roadmap, which describes the path the industry is following to improved energy efficiency and productivity.

The Glass Manufacturing Industry Council (GMIC) and its members in all sectors of the glass industry have been very active in their work with EERE in the last year in many areas. A major achievement of the collaboration has been the completion of the *Glass Industry Roadmap*, which describes the path the industry is following to improved energy efficiency and productivity. Additional publications developed through this partnership include a glass industry CD that provides complete information on tools, resources, and literature available in support of the industry and a set of “Cost Reduction How-To” fact sheets that provide step-by-step approaches to identifying and eliminating energy inefficiencies in plant operations.

To expand possible opportunities for energy efficiency improvements in the industry, the GMIC is supporting developing EERE State Industry of the Future programs in Florida, Indiana, New Jersey, North Carolina, Ohio, West Virginia, and Wisconsin with information and contacts in the local glass industry and guidance in establishing their programs. An Ohio proposal recently obtained a competitive award to support research in productivity developments in fiberglass forming.

Capital costs and energy use are two of the major concerns regarding glass industry profitability. The GMIC last year initiated a long-term program to address these issues: the Next Generation Melting System (NGMS) Project was launched in early 2001 as a 15–20 year effort to identify a new “Glass Business Model” that will lead to step changes in the efficiency and profitability of the industry. An initial Technical and Economic Assessment, currently underway in collaboration with EERE, will determine the current state of melting technologies as well as examine past efforts to improve the technologies that will serve as a baseline for exploring new directions for the industry.

The 2-year old G+ Program permits individual member companies to pursue improvements in selected areas of their operation with DOE national laboratory support. Through a simplified application and administrative process, companies can obtain up to \$25,000 worth of research work to resolve specific problem areas in their operations. Results from these short-term projects are then shared with other members to obtain maximum effects.



The Hitchiner Manufacturing Co., Inc., has been an important partner with the Metal Casting Industry of the Future (IOF) and is taking a leadership role in advancing the state IOF efforts in New Hampshire and Massachusetts as well as in disseminating information on BestPractices and other EERE services. The company has been an advocate for the IOF process and has championed the IOF strategy in national and state-level conferences and other events.

Hitchiner has invested the valuable time and expertise of the company’s leadership, which has proven integral to the success of this research program. Senior executives from Hitchiner have participated in numerous EERE and program activities, including EERE Expos, Customer Days, State IOF ceremonies and other events.

Senior Hitchiner executives have participated in numerous EERE and program activities, including EERE Expos, Customer Days, State IOF ceremonies and other events.

Executive Vice President of Operations Paul Mikkola has been a champion of the program since its inception, serving on both the Industrial Advisory Board and the Industrial Oversight Panel. In this capacity he has provided expert input on the program’s R&D portfolio, stressing foresight and energy efficiency. He has provided his leadership to the industry’s long-term visioning and roadmapping activities. He helped facilitate the Metal Casting “Future Think Forum,” in which over 30 leaders from industry provided critical insights on the future of the industry. It was the first step in updating the Metal Casting Vision and Compact.

Moreover, Dr. Mikkola has long been an advocate of Metal Casting IOF lost foam casting research. This has been a major EERE success and was recently commended by the National Research Council. He has been a leader in applying the results of lost foam and other metal casting research and has championed the application of advanced metal casting processes throughout the industry. These efforts are leading to significant improvements in casting productivity and are helping the industry to improve energy efficiency in casting processes.



As the largest association of pump producers in North America, the Hydraulic Institute (HI) is committed to raising awareness of new methods for increasing energy efficiency among manufacturers, purchasers, and users of pumps and pumping systems. HI has done so successfully by collaborating with DOE's Office of Energy Efficiency and Renewable Energy (EERE) on numerous projects since 1993 when HI joined the Motor Challenge Program as a charter member.

HI and Europump, with support of DOE, developed and published *Pump Life Cycle Costs: A Guide to LCC Analysis for Pumps and Pumping Systems*. Europump is spokesperson for 15 European pump associations. In 2001, more than 1,000 hard copies of this guide were distributed, with a downloadable version also made available on the HI and DOE BestPractices Web sites. In addition, more than 10,000 copies of the LCC Guide's Executive Summary were downloaded from the HI Web site alone. Over 2,500 copies of the LCC Guide have been sold and distributed to manufacturers and users. Copies have been translated into French, German, and Polish.

A highlight of the HI Web site continues to be the extensive Energy Savings section, featuring many downloadable DOE tools, resources, software and case studies. Here, HI has helped promote DOE's *MotorMaster+* and the *Pumping System Assessment Tool (PSAT)* software as well as information on BestPractices and Web links to Allied Partnership information. HI also makes available an excellent "Energy Reduction in Pumps and Pumping Systems" video-based education program, developed with DOE support.



More than 10,000 copies of the LCC Guide's Executive Summary were downloaded from the HI Web site: www.pumps.org.

HI has encouraged its members to become Allied Partners, with several regularly participating in DOE sponsored events and activities. In fact, two HI member organizations have committed to energy efficiency by holding "in-house" sessions of the PSAT Qualified Specialist training at their facilities. Through these sessions, engineers and facility operators are learning how to accurately assess the operating efficiency of their pumping systems.

For 85 years, HI has been developing pump industry standards, defining components, installation, application, operation, and test procedures. Increasingly, HI standards are addressing systems issues. HI is proud to partner with DOE. The Institute looks forward to a strong partnership, and helping to make pump energy efficiency and life cycle cost both a widely-accepted business strategy and an industry standard.



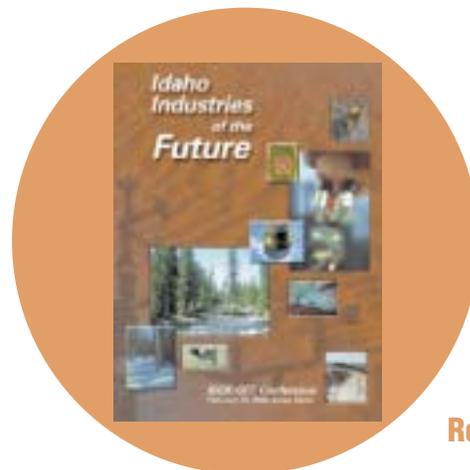
The Idaho State Industry of the Future (IOF) is improving the energy efficiency and competitiveness of key industries in Idaho, including agriculture, forest products, and mining. In 2000, Idaho Governor Dirk Kempthorne became the nation's first governor to sign an MOU with DOE's Office of Energy Efficiency and Renewable Energy.

Idaho received a \$200,000 State Energy Program Special Project grant in FY2000 to develop its IOF Program. Activities completed by the program include:

- Publishing the Idaho Forest Industry Strategic Technology Development Plan in May 2001
- Conducting the Idaho Industrial Summit on November 13, 2001, with participation from Idaho industry, government, and academia
- Organizing a meeting in Twin Falls in December 2001 to demonstrate a working pilot plant of the acid recovery phase of a biorefinery—a key agriculture project
- Creating and presenting the first Idaho Innovation in Industry Awards for technological advances in Idaho agriculture, forest, and mining industries
- Producing two Best Practices workshops in pump efficiency with the Idaho Mining Association and NW Mining Association in June 2001. These workshops led to a project at Hecla Mining with Oak Ridge National Laboratory to generate power from cooling water as it falls from the surface.

A number of other activities and relationships have emerged as a result of the State IOF. Specifically, the State Energy Division has expanded its working relationship with Idaho National Engineering and Environmental Laboratory, the University of Idaho, and Idaho's agriculture, forest products, and mining industries.

The University of Idaho College of Agriculture, the Idaho Food Producers Commission, and the Ad Hoc Committee worked to integrate the Industries of the Future strategy into the Ag Initiative 2001, a legislative effort to create a state research grant agency for agriculture. The initiative failed to pass, but forged working relationships for future efforts.



In 2000, Idaho Governor Dirk Kempthorne became the nation's first governor to sign an MOU with DOE's Office of Energy Efficiency and Renewable Energy.



The Industrial Heating Equipment Association (IHEA) is a national trade association representing the major segments of the industrial heat process equipment industry. The organization counts among its members the leading designers and manufacturers of all types of heating equipment used for the melting, refining, and heat processing of ferrous and non-ferrous metals, and certain non-metallic materials. It is the common goal of IHEA and DOE to promote increased energy efficiency for industrial process heating applications.

IHEA is excited about progress made in the past year on a range of DOE-EERE sponsored projects. Cooperation with DOE was initiated with the development of a process heating roadmap document. Since its publication, areas of activity have been expanded and significant progress has been made. Primary among the activities are:

- Assessment tool development
- Tip sheets and fact sheets
- Training to support the systems approach
- Sensor and process controls
- Materials forum
- Web site coordination.

IHEA members have been actively supporting the above activities through committee membership. Three committees presently exist. The first is in support of the Process Heating Assessment and Survey Tool (PHAST). This committee counts members from end-user companies, energy producers, and the national labs. The second committee is in the Sensors and Controls cross-cutting technology segment. Finally, a Materials Task Group has been assembled to address materials needs for process heating equipment and the role of the national laboratories in helping to meet the future needs of the industry.



It is the common goal of IHEA and DOE to promote increased energy efficiency for industrial process heating applications.



IMERYS offers the most comprehensive selection of kaolins for paper. Located in Georgia, IMERYS supplies nearly 4 million tons of kaolin worldwide annually for the paper industry, more than twice that of the nearest competitor. IMERYS continues to invest heavily in production and process control technology to reduce costs, develop new products, and extend crude reserves. Over the past 2–3 years, they have become a major supporter of the EERE Mining Industry of the Future (IOF) initiative.

Dr. Robert Pruett, of IMERYS, has been a large supporter of the Mining Industry of the Future. IMERYS has participated in the following EERE activities:

- Hosted an EERE BestPractices training workshop
- Participated in technical reviews of proposals for solicitations
- Formed a working relationship with the DOE Savannah River laboratory
- Attended Mining IOF roadmap workshops.

More importantly, IMERYS has agreed to host a Georgia Mining Showcase scheduled for April 2004. This showcase will highlight and demonstrate Mining IOF research. In addition, the Georgia showcase will demonstrate implemented energy saving practices that were recommended by EERE's BestPractices Program.



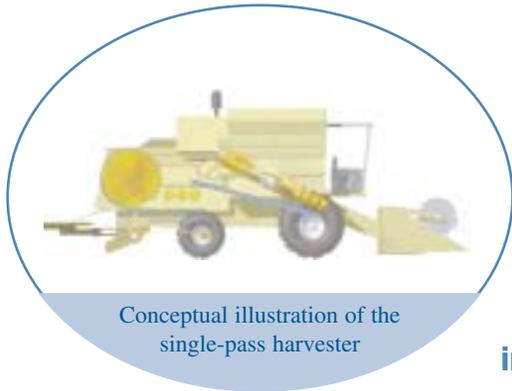
Calciner at Imerys

The Georgia showcase will demonstrate implemented energy savings practices that were recommended by EERE's BestPractices Program.



Iowa State University (ISU) is very active in the arena of biobased products and bioenergy, partnering with EERE for two biobased products, R&D projects, and receiving two Education Initiative grants, in addition to being a key player in the Iowa State-Level Industries of the Future efforts. ISU also houses the Center for Sustainable Environmental Technologies whose mission is to develop, demonstrate, and promote sustainable environmental technologies such as biobased products and bioenergy. The Biorenewable Resources Consortium, a partnership among the Ames Laboratory, the Experiment Station and the Plant Sciences Institute, is developing biobased alternatives to fossil fuel-derived products.

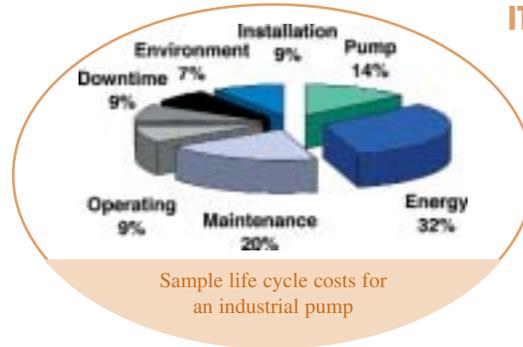
The new harvester will reduce the time, energy, and cost of collecting wheat straw and enable the maximum use of wheat straw components in value-added products.



Conceptual illustration of the single-pass harvester

As the recipient of two Education Initiative grants, ISU is helping to train the next generation of scientists for the biobased products industry. The development of biobased products cuts across the boundaries of scientific disciplines such as agronomy, plant science, chemistry, engineering, and economics. This results in the need for researchers with both in-depth knowledge of their primary discipline, and significant exposure to these other disciplines. The Education Initiative programs are designed to provide graduate students multi-disciplinary training and a systems perspective of the biobased products industry with an appreciation of problems in plant sciences, production, conversion, and utilization.

For the first R&D project, “Multi-Component Harvesting Equipment for Inexpensive Sugars from Crop Residues,” ISU is involved in developing a single-pass harvester to collect the wheat straw components desired as feedstocks for chemicals. The new harvester will reduce the time, energy, and cost of collecting wheat straw while enabling the maximum use of wheat straw components in value-added products. The sale of wheat straw will help boost domestic farm profitability, and the displacement of products derived from imported fossil fuels will increase national energy security. ISU is also contributing their expertise and facilities for harvesting machinery development to the second project, “Collection, Commercial Processing, and Utilization of Corn Stover,” led by BioMass Agri-Products LLC.



Sample life cycle costs for an industrial pump

ITT has been a driving force behind the Hydraulic Institute’s work with the U.S. Department of Energy, which focuses on reducing industrial energy consumption and greenhouse gases.

ITT Industries’ Fluid Technology business, the world’s leading pump producer, is dedicated to excellence in engineering, manufacturing, and applying pumping equipment. ITT Industries, Inc. (<http://www.itt.com>) supplies advanced technology products and services in key markets including electronic interconnects and switches; defense communication, opto-electronics, information technology, and services; fluid and water management; and specialty products. Headquartered in White Plains, New York, the company generated \$4.7 billion in 2001 sales.

As one of the industry’s forerunners and premier advocates for life cycle costing, the company has educated thousands of pump users on the subject. ITT has published multiple articles on the topic, and played a pivotal role in the development of a 200-page guide entitled, *Pump Life Cycle Costs: A Guide to LCC Analysis for Pumps and Pumping Systems*. The guide was published jointly by the Hydraulic Institute and Europump, an organization comprised of various national pump associations in Europe.

ITT has also been a driving force behind the Hydraulic Institute’s work with the U.S. Department of Energy, which focuses on reducing industrial energy consumption and greenhouse gases. These efforts have also strengthened the Hydraulic Institute’s ties with DOE’s Office of Energy Efficiency and Renewable Energy (EERE).

ITT has also been active in developing and participating in the DOE-California Energy Commission’s Energy Solutions for California event. Together with DOE, ITT has implemented several breakthrough showcases.

ITT is especially proud of its six employees that have become qualified Pump System Assessment Tool specialists.

Kaeser Compressor

Kennecott Utah Copper



Kaeser became the only compressor manufacturer designated as an Allied Partner of the U. S. Department of Energy in May of 2001.

Kaeser Compressors, Inc. has been in business for more than 85 years, providing quality compressed air products to the worldwide market. The company specializes in individually evaluating each customer's compressed air application, and providing the most efficient and effective air system solution. In addition to equipment, its solutions approach includes services that evaluate air consumption, storage capacity, air wasted to leaks, artificial demand caused by over pressurization and misapplication, and varying demands in flow and pressure.

Kaeser's proprietary developments and equipment designs have also helped many customers save thousands of dollars in energy costs every year. The company knows that 70 percent of compressed air cost is the electricity to run the compressor, and that getting more air for less energy can make a big impact on the facility's bottom line. That's why Kaeser's extensive research and development team is committed to designing equipment that is energy efficient, reliable, and requires minimal maintenance.

Furthering its commitment to providing end users with the most energy efficient air systems, Kaeser Compressors is a proud member of the Compressed Air and Gas Institute (CAGI). The company was the first equipment manufacturer to publish its compressor's total package performance on the World Wide Web according to CAGI standards. Kaeser's Technical Director, Wayne Perry, was unanimously selected by the CAGI's Energy Awareness Committee to be CAGI's representative to the board of the Compressed Air Challenge. Wayne Perry also serves as CAGI's representative to the Office of Energy Efficiency and Renewable Energy Best Practices Steering Committee.

In May of 2001, Kaeser Compressors, Inc. became the only compressor manufacturer designated as an Allied Partner of the U. S. Department of Energy. The company helped DOE and the California Energy Commission develop "Solutions for California Industry" a series of informational seminars and conferences for industrial end users seeking to reduce energy consumption while improving operations and profitability.

Kaeser is a global force in the compressed air industry and continues to be committed to energy efficient air systems through training, education and innovative product designs.

Every year, Kennecott Utah Copper produces about 310,000 tons of refined copper—along with 450,000 ounces of gold, 4 million ounces of silver, about 22 million pounds of molybdenum, and over 1 million tons of sulfuric acid, a by-product of the smelting process. Kennecott Utah Copper is the second largest copper producer in the United States, providing 15 percent of the country's copper needs. The copper comes from the Bingham Canyon Mine, the largest open pit copper mine in the world, located near Salt Lake City, Utah.

Kennecott Utah Copper was a key player in the Utah 2001 Industry Showcase in August 2001. One of the research projects showcased was the EERE Mining IOF project "Three-Dimensional Simulation of Charge Motion in Semiautogenous Grinding (SAG) and Ball Mills for



SAG Mill at Kennecott Copper

Kennecott Utah also worked with EERE Best-Practices program to initiate energy saving practices throughout its facilities to become more energy efficient.

Energy Efficiency." This project is developing a three-dimensional simulation software application that optimizes the operating conditions of grinding mills and can save an estimated 10.5 trillion Btu annually by 2020. Kennecott Utah also worked with the EERE BestPractices program to initiate energy saving practices throughout its facilities to become more energy efficient. David George is the Mining IOF contact at Kennecott Utah Copper, and was instrumental in organizing the Utah 2001 Industry Showcase.



Kentucky began its effort by focusing on its aluminum industry, with nearly 80 mostly small- and medium- sized facilities throughout the state. “With all the mergers in the aluminum industry, it was clear that R&D is taking a backseat—often it’s the first thing that’s cut,” said Dr. Subodh Das, President of SECAT, Inc., and Director of the Center for Aluminum Technology at the University of Kentucky in Lexington. “EERE is helping us ensure that the industry in Kentucky and around the country stays strong.”

A consortium involving aluminum firms, the University of Kentucky, the Kentucky Economic Development Cabinet and DOE’s Office of Energy Efficiency and Renewable Energy sponsored a Kentucky aluminum industry roadmap session in early 1999. The effort brought together industry representatives and researchers to discuss common needs. They ultimately contributed to the award of four R&D projects (involving about \$15 million) to Kentucky companies. Recently, Kentucky firms brought together by DOE’s States Industries of the Future effort won a fifth aluminum-related project through an EERE program for university-led R&D projects.

Kentucky is now expanding its success to other industries in the state. A new State Energy Program grant will target the agriculture, forest products, chemicals, mining, and steel industries. A well-attended roadmapping workshop for the state’s chemical industry was held in June, and mining industry representatives have joined forces to submit R&D proposals to EERE-sponsored programs.



Kentucky’s industries are very energy-intensive, so everything we can do to reduce energy use helps us be more competitive. DOE’s States IOF program is helping us do that.
—Geoff Young

Kentucky Division of Energy

“That seed money from DOE’s State IOF program and access to outstanding resources is the impetus that will help us achieve great things in Kentucky,” said Dr. Das.

For more information, visit www.nr.state.ky.us/nrepc/dnr/energy/doeiof.html.



Measures of success for the Maine IOF Program are related to the goals of the DOE Industries of the Future (IOF) to broaden the impact of investments in advanced industrial technologies and practices for energy savings and waste reduction. Accordingly, the Maine IOF Program’s measures of success are:

- Enthusiastic support and participation from three targeted industry sectors, the pulp and paper, wood products, and metals industries
- Enthusiastic support from key state agency commissioners and the university system and subsequent staff participation on the steering committee
- Identification of Maine IOF as an important resource in the state’s economic development strategy stated by the Maine Department of Economic Development (DECD).
- Two facilitated roadmapping events with all three industry sectors
- A Successful Energy & Technology EXPO
- Development of Maine IOF communication systems through a monthly electronic newsletter and Web site www.maineiof.org.

Extensive industry involvement has been a key to the program’s success. An implementation plan will be presented at the June 2002 Maine DECD annual Energy Conference. Issues and goals that cut across all industry sectors include:

- Reduction in energy use per unit of output
- Secondary market development and R&D for waste streams
- R&D leading toward new products, processes, and services
- Improved access to technology transfer
- Improved rail, highway, and inter-modal shipping systems
- Best practices implemented throughout industry.

At the 2001 Energy and Technology EXPO held at the University of Maine (UM), the positive benefits companies derive from utilizing new technologies were publicized, emerging technologies were demonstrated, and the UM research and development facilities were featured.

The Maine IOF continues to work with its three industry sectors to create visions that lead to the development of the critical technologies required by each industry sector to meet future demands in the marketplace.

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Denise Swink and Governor Angus King signing the MOU, April 2001.



Mercury Marine has been a consistent and valued partner since the inception of the Metal Casting Industry of the Future (IOF). The company promotes and advances energy efficiency as a national goal. It has provided the technical expertise of its management and staff as well as valuable industry cost share on a long list of advanced metal casting research projects including Lost Foam, Clean Steel, Alternative Granular Molding Media, and many others.

Mercury Marine has been instrumental in applying and validating the results of this research through experiential data. For example, it helped demonstrate that lost foam casting has the potential to reduce energy consumption by as much as 27 percent, compared to sand casting. It shared the results of its innovative applications for alternative granular molding media, calling it “one of the most significant advancements in lost foam since unbonded sand was patented in 1964.” It has provided data to support outside reviews by the Centre for the Analysis and Dissemination of Demonstrated Energy Technologies and the National Research Council. Mercury Marine champions the Metal Casting IOF and has been an enthusiastic supporter of the industry Compact, Vision, and Roadmap. This support has continued throughout 2001 and 2002 as the industry updates these guidance documents.

Recently, Mercury Marine invited Deputy Assistant Secretary Denise Swink to participate with the Governor of Wisconsin at the dedication of its Fon du Lac, Wisconsin, Pressurized Lost Foam Facility. The company’s participation has been led by Senior Director for Advanced Materials and Foundry Technology, Dr. Raymond Donahue. He has consistently stressed the importance of national energy security and improved energy and environmental performance. He has participated in all industry vision, roadmapping, and compact activities, and shown leadership in State IOF activities in Wisconsin. He was Chairman of the Metal Casting Industrial Advisory Board and currently volunteers on the Industrial Oversight Panel. He has championed the IOF strategy and promotes EERE and Metal Casting IOF activities industry-wide.

The Materials Technology Institute (MTI) is a non-profit technology organization that has served the chemical process and allied industries for 25 years. Corporate membership numbers 62, including chemical, petroleum, forest products, materials suppliers, and welding service companies, which collaborate to leverage resources for non-proprietary activities of interest to the entire membership.

In 1997 MTI took the lead in preparation of the *Technology Roadmap for Materials of Construction, Operation, and Maintenance in the Chemical Process Industries* and subsequently submitted five proposals to the Chemical Industry Solicitation. All were highly rated and funded. MTI is now working with EERE to revise the Roadmap to include other industries such as petroleum, forest products, and agriculture.

MTI is a member of the Vision2020 steering committee that promotes collaboration across the chemical process industry. MTI has recently agreed to become an Allied Partner with EERE to raise awareness of EERE resources and information; promote Best Practices; develop Showcases; participate in States IOF programs; and participate in workshops and topical conferences.

Mercury Marine helped demonstrate that lost foam casting has the potential to reduce energy consumption by as much as 27 percent compared to sand casting.

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NASEO

For more than a decade, the National Association of State Energy Officials (NASEO) has provided leadership on energy issues, guiding regional, state and federal government officials toward a deeper understanding of energy's pivotal role in the economy and environment, and informing them about the specific energy priorities and concerns of the states and territories.

Affiliated with the National Governor's Association, NASEO members are officials from the State and Territory Energy Offices and affiliates from the private and public sectors. NASEO was created by the governors to improve the effectiveness and quality of state energy programs and policies, and to be a collector and repository of energy-related information. NASEO meetings and communications offer a forum for energy officials, policymakers and others to exchange information and discuss issues with regional and national implications.

NASEO is undertaking a number of activities to promote the EERE State Industries of the Future program and emerging industrial technologies by facilitating electronic and print communications with the states.

NASEO has become an EERE Allied Partner and recently signed a memorandum of understanding with EERE to increase cooperation and leverage resources.

A part of this effort was the establishment of NASEO's Industrial Committee at the February 2002 NASEO Energy Outlook Conference. State members of this new committee will work with NASEO and EERE staff to identify needs and opportunities and work to make new State Energy Program Special Project activities a success.

In addition, NASEO is undertaking a number of activities to promote the EERE State Industries of the Future program and emerging industrial technologies by facilitating electronic and print communications with the states. NASEO is also increasing efforts to include important industrial topics on the agendas of NASEO's Annual and Energy Outlook meetings.

NASEO has partnered with DOE's Office of Energy Efficiency and Renewable Energy's Industries of the Future Program (IOF) to assist State and Territory Energy Offices and their industry partners. NASEO has

National Corn Growers Assoc.



M. Alnajjar, of PNNL, works on corn oil recovery and analyses

With EERE and the Industries of the Future, we found people who were willing to listen to our needs and work

with us to address them. It is so refreshing to find someone in government who is truly interested in what industry needs.

—Lee Klein

National Corn Growers Association Chairman

In 1996, the National Corn Growers Association (NCGA) approached DOE's Office of Energy Efficiency and Renewable Energy (EERE) with the goal of establishing an Agriculture Industries of the Future as a way of catalyzing the development of the biobased products industry. With the signing of a Compact in 1998 with EERE and 14 other national organizations to establish the partnership commitment between the private sector and government, and involvement in the development of the *Plant/Crop-Based Renewable Resources Vision 2020* and accompanying Industry Roadmap, NCGA has proven to be a staunch supporter of EERE and the Agriculture IOF and this partnership continues to flourish.

NCGA provides a link between corn growers, the researchers developing new biobased products, and industrial companies looking for opportunities to produce biobased products. They are a partner on three projects funded by EERE. Technologies under development include the conversion of corn glucose to chemicals such as ethylene and propylene glycol and the synthesis of 1,3-propanediol, the chemical precursor of a novel polymer. The 2020 market potential for these technologies is estimated at 1 billion pounds per year and 500 million pounds per year, respectively, and would yield total fossil fuel energy savings of 19.2 and 10.4 trillion Btu per year. The third project focuses on the use of corn fiber as feedstock for a biorefinery that could produce ethanol, ethylene, and propylene glycol, and other value-added chemicals.

NCGA has recently elected to become an Allied Partner with EERE. This will further its ability to advance energy conservation in agriculture, as well as its support for the development of new biobased product technologies.





The National Mining Assoc. has enthusiastically supported the Mining IOF, including the development of an industry vision, three technology roadmaps, and four research and development solicitations.

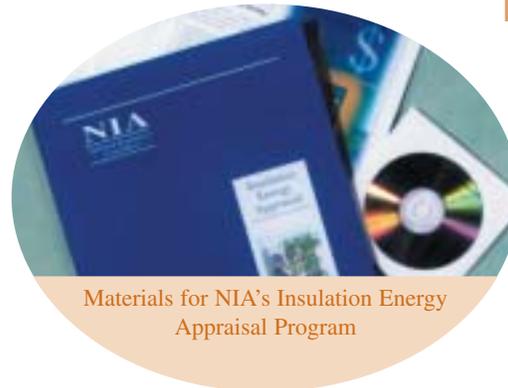
The National Mining Association (NMA) was created in 1995 as a result of the merger of two major organizations representing the mining industry at the national level: the National Coal Association and the American Mining Congress. NMA's current members include coal, metal, and mineral hardrock mining operators, mineral processors, bulk transporters, mining equipment manufacturers, financial and engineering firms, and other businesses and associations related to the mining industry.

NMA is the industry partner of the EERE Mining Industry of the Future (IOF) initiative. Since signing its Compact with DOE in 1998, NMA has enthusiastically supported the Mining IOF, including the development of an industry vision, three technology roadmaps, and four research and development (R&D) solicitations. NMA coordinates broad industry participation in the program, including the 28 R&D projects that involve over 110 industry, university, and national laboratory partners. NMA, through its Technology Committee and Industry Oversight Panel, offers technical and portfolio guidance to the Mining IOF.

NMA has participated in events such as the EERE Energy Efficiency Expos, Customer Days, and the Utah 2001 Industry Showcase. NMA promotes the Mining IOF and disseminates R&D results to the industry and public through conferences, seminars, its Web site, and various publications.

The National Insulation Association (NIA), a northern Virginia based trade association representing the mechanical and specialty insulation industry, was founded in 1953. It has approximately 450 member companies consisting of contractors, manufacturers, distributors, laminators, and fabricators.

NIA developed the Insulation Energy Appraisal Program (IEAP) in the fall of 2000. This program is a major industry initiative designed to give facility/energy managers a better understanding of the true dollar and performance value of an insulated system. The program is a tool that quantifies the amount of energy and actual dollars a facility is losing with its current in-place insulation system. To date, 215 industry professionals have earned the title of "Certified Insulation Energy Appraiser."



Materials for NIA's Insulation Energy Appraisal Program

Because of this partnership, the recognition of industrial insulation's contribution to industry has risen significantly.
—Bill Pitkin
NIA

Students learn how to: determine the optimal insulation thickness and corresponding energy and dollar savings; interview customers to gather information for the appraisal; conduct a facility walkthrough; use the 3E Plus® computer software program; determine the amount of greenhouse gases saved through the use of insulation; analyze and complete the appraisal spread sheet; complete a final customer report; and market their new skills to potential customers.

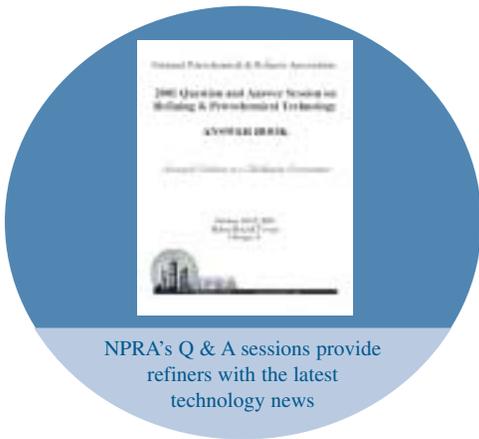
There are a number of reasons why facility managers want to consider an insulation energy appraisal at their location. These reasons include the potential for hundreds of thousands of Btu savings, the opportunity to improve process control and efficiency, contributing to a cleaner environment through the reduction of emissions into the atmosphere, and saving money through reduced fuel costs.

Bill Pitkin, NIA executive vice president and chairman of DOE's EERE Steam BestPractices believes that "the partnership of trade associations and government, such as NIA and EERE, has been one of the most outstanding successes of promoting the greater use of insulation. Because of this partnership, the recognition of industrial insulation's contribution to industry has risen significantly."

The National Petrochemical and Refiners Association (NPRA) represents approximately 460 companies. Primarily, these are the companies and suppliers that provide consumers with transportation fuels, home heating oil, and the petrochemicals that serve as “building blocks” in making everything from plastics and clothing to medicine and computers.

A number of NPRA activities support technical advancement and continued progress in safety and environmental performance. NPRA participates in the Responsible Care® Partnership Initiative designed to continually improve the industry’s health, safety, and environmental performance. NPRA’s Maintenance and Manufacturing Committees focus on the application of new technologies, technology transfer, and sharing of best practices to improve the operations of member companies. NPRA holds an annual Question and Answer Conference designed to provide for the discussion of issues, trends, and challenges focusing on the refining and petrochemical industries.

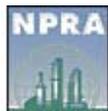
NPRA worked with EERE on the development of the *Technology Vision 2020—A Report on Technology and the Future of the U.S. Petroleum Industry*, and the *Technology Roadmap for the Petroleum Industry*. These documents focus on the research needed to strengthen the industry over the next two decades. The vision advocates cooperation among the petroleum industry, the U.S. Department of Energy, the national laboratories, and academia. NPRA members contribute to EERE activities in a number of ways. Members supported the EERE 2001 Utah Showcase, they provide sites for project demonstrations,



NPRA’s Q & A sessions provide refiners with the latest technology news

EERE and NPRA continue to work together to develop joint strategies that address the needs of the refining industry and promote the adoption of technologies that will make the industry safer and more energy efficient.

and they provide valuable input on the portfolio of projects. EERE and NPRA continue to work together to develop joint strategies that address the needs of the refining industry and promote the adoption of technologies that will make the industry safer and more energy efficient.



The Northeast Utilities System (NU), at the forefront of energy efficiency programs for more than two decades, helps customers in Connecticut, Massachusetts, and New Hampshire save energy, money, and the environment while bolstering the local economy in each state.

Last year, by leveraging effective alliances such as its affiliation with DOE’s Office of Energy Efficiency and Renewable Energy (EERE), sponsorship of the Compressed Air Challenge (CAC), and partnerships in the Motors Decisions Matter and Motor-up Program, NU, in cooperation with other New England utilities, hosted the first Qualified *AIRMaster* Specialist Training sessions and a number of CAC sessions and workshops that successfully trained 216 people. As a result of these efforts and the design and implementation of innovative energy-saving programs, NU has helped industrial customers save over 81,000 megawatt hours with their 2001 projects.

Examples of these programs include The Connecticut Light and Power Company’s (CL&P) PRIME (Process Reengineering for Increased Manufacturing Efficiency) program. CL&P, NU’s Connecticut subsidiary, through PRIME and in partnership with CONNSTEP, a state-sponsored agency that helps manufacturers increase productivity by adopting LEAN-manufacturing processes, helped industrial customers increase throughput by \$44 million and preserve more than 20,000 jobs. Through its Custom Services Incentive program, CL&P showed Johnson and Johnson’s Medical, Inc. how to transform an inefficient compressed air system into a state-of-the-art system that is saving the Southington, Connecticut-based company \$120,000 annually. CL&P’s Research Development and Demonstration (RD&D) program supports new, cutting-edge technologies that might otherwise not get to market. One RD&D project, scheduled to be ready for market in 2003, combines traditional manufacturing processes with fuel cell plate production and could cut production costs by 50 percent.

These programs, partnerships, and initiatives are consistent with NU’s promotion of its “energy efficiency ethic,” encouraging customers to use energy wisely with an eye on the environment.

Already, thousands of customers participate in our energy-efficiency programs. But, as we move to fully deregulated environment and the price of electricity takes on more significance, so will NU’s energy efficiency programs and services.
—Colin G. Odell
Senior Program Administrator



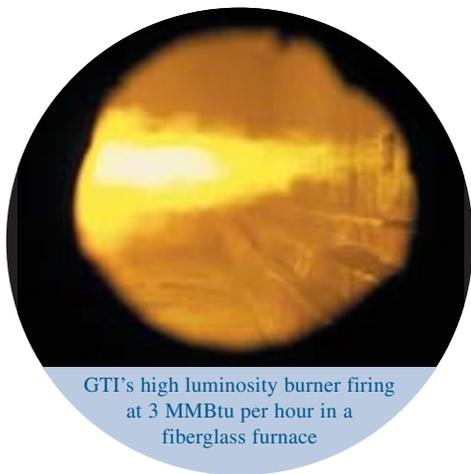
Northeast Utilities System

Since inventing glass fiber insulation more than 50 years ago, Owens Corning has been a technological leader in the glass industry. With its leading position in the production of glass fiber materials for insulation and composites, Owens Corning has an impressive history of promoting and supporting the rational and productive use of energy, and has developed a comprehensive understanding of energy second to none.

Owens Corning promotes the development of new technology with its world-class science and technology team. Parallel engagements aimed at reducing energy waste and costs, at increasing efficiencies and advancing technology are at the core of Owens Corning's efforts. Owens Corning also understands the value and power of partnerships, whether with suppliers, customers, or others. Among these partnerships are two with DOE's Office of Energy Efficiency and Renewable Energy (EERE):

- **Development and Validation of a Coupled Combustion Space/Glass Bath Furnace Simulation**—Along with Argonne National Laboratory and other project partners, Owens Corning is participating in the development of a three-dimensional model that provides a more accurate representation of the entire melting process. Projected benefits include the optimization of melter operation and combustion process, improved production efficiency, and reduced costs and emissions.
- **High-Luminosity, Low-NOx Burner**—Owens Corning recently hosted the first full-scale demonstration of a new burner developed by the Gas Technology Institute. The burner increases luminosity and radiant heat transfer in the glass furnace, and was successfully tested at an Owens Corning facility in New York. Projected benefits include increased thermal efficiency, thereby reducing energy consumption; reduced NOx emissions; and increased furnace productivity.

Along with these efforts, Owens Corning was a founding member of the Glass Manufacturing Industry Council (GMIC), has made significant contributions to implementing the EERE glass portfolio by evaluating research projects and serving on GMIC technical subcommittees, and is supporting GMIC efforts to evaluate the potential for a next generation glass melting system.



GTI's high luminosity burner firing at 3 MMBtu per hour in a fiberglass furnace

Owens Corning understands the value and power of partnerships.



As a leading global supplier of flat glass, fiber glass, and coated glass products, PPG Industries has long been a technological leader in the glass industry. PPG business units are supported by a comprehensive program of research and development. Finding techniques that improve efficiency is a pillar of PPG's research efforts, as are ongoing efforts to make its production processes environmentally-friendly.

PPG conducts glass research in technical centers for both flat and fiber glass production. The company actively seeks research partnerships with universities and U.S. government agencies and laboratories, including the U.S. Department of Energy. Among these partnerships are three with EERE:

- **Diagnostics and Modeling of Refractory Corrosion in Oxy-Fuel Furnaces**—Working with Sandia National Laboratories, PPG is determining corrosion factors and developing mathematical models that can predict corrosion rates, identify operating conditions that minimize corrosion, and define the attributes of improved refractories for oxy-fuel firing. Projected benefits include extended refractory lifetime, which reduces production costs, and increased industry conversion to oxy-fuel firing, which reduces energy consumption and NOx emissions and increases productivity.

- **Process Optimization Strategies, Models, and Chemical Databases for On-Line Coating of Float Glass**—Also working in conjunction with Sandia National Laboratories, PPG is developing new control

strategies and process models to significantly improve the efficiency of depositing coatings on float glass. Modifications to the existing deposition technique as well as new coater designs are being evaluated. Projected benefits include higher yield of coated products, which reduces remelting energy use and costs, reduced raw material usage, and more efficient use of costly chemical precursors.

PPG research has resulted in improved understanding of the thermodynamics and corrosion of refractors in an oxy-fuel environment.
—Dr. Amar Mishra
PPG Industries, Inc.

- **Clean, Efficient Glass Production Using High-Luminosity Oxy-Gas Burners**—During a planned conversion of a float glass furnace to oxy-fuel firing, PPG will demonstrate a new burner technology. Developed by the Gas Technology Institute and its marketing partner Combustion Tec, the burner increases luminosity and radiant heat transfer in the glass furnace. Projected benefits include increased thermal efficiency, which reduces energy consumption, reduced NOx emissions, and increased furnace productivity.

Along with these efforts, PPG was a founding member of the Glass Manufacturing Industry Council (GMIC), and is supporting GMIC efforts to evaluate the potential for a next generation glass melting system.



Praxair

Praxair, Inc. conducts cutting-edge R&D in connection with its position as a leading global supplier of atmospheric, process, and specialty gases; high-performance coatings; and related services and technologies. In addition, the Fortune 500 company designs, engineers, and builds advanced cryogenic and non-cryogenic supply systems.

Founded in 1907, the company was the first to commercially separate oxygen using cryogenics. In 1992, it adopted the name Praxair, which combines the Greek word for “practical application” with “air”—the company’s primary raw material.

Praxair complements its robust internal technology development program with a range of collaborative technology partnerships, including several ongoing R&D partnerships with the Office of Energy Efficiency and Renewable Energy (EERE):

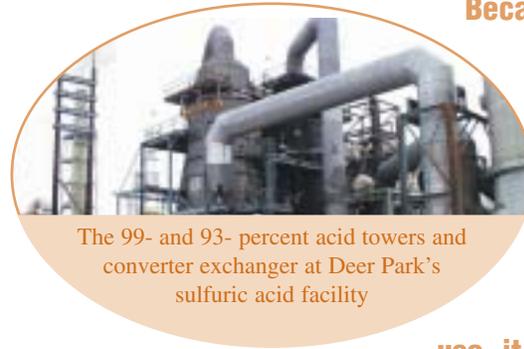


We need to think broadly about the chemical enterprise and involve all of the components that can bring or gain benefit. Each element of the enterprise adds to the ultimate value of Chemical Industry Vision2020 Technology Partnership.
—Jack Solomon
Praxair, Inc.

- **Advanced Sorbents for Gas Separation**—Working to develop a commercially viable oxygen-selective sorbent for separating commercial gases using pressure swing adsorption. This technology requires less energy for gas separation and provides high-purity gases at lower prices. Projected benefits include 4.2 trillion Btu per year saved from industrial use of low-cost gas and 25- to 30-percent reduction in production costs of industrial gases.
- **Short-Contact-Time Reactors**—Working with Sandia National Laboratories and Reaction Design, Inc. in applying computational technologies and catalyst characterization to develop a new process for making syngas from methane. Projected benefits include reduction in capital costs and fuel consumption and elimination of NO_x and significantly lowered CO₂ emissions.
- **Oxidation Olefin Reactor**—Developing a novel process to replace energy-intensive steam cracking. The process employs a short reaction-time catalyst and advanced gas-mixing technology to lower energy use and production costs in ethylene manufacture and similar operations. Projected benefits include a 20-percent cost reduction and reduction in CO₂ emissions.
- In addition, Praxair Director of R&D, Jack Solomon, is chairing the Chemical Industry Vision2020 Technology Partnership steering group, while the company is participating in Chemicals Plus projects and in the first Vision2020 Challenge initiative.



Rohm and Haas Company



The 99- and 93- percent acid towers and converter exchanger at Deer Park’s sulfuric acid facility

Because our Deer Park facility accounted for such a large portion of the company’s total energy use, it was an ideal

place to apply BestPractices techniques. With the help of EERE’s assessment project, we were able to reach our energy expenditure reduction goals 5 years ahead of schedule.

—Jeffrey Hackworth
Deer Park Plant Energy Manager

Rohm and Haas Company is one of the largest producers of specialty chemicals in the world. Manufacturers in an array of industries use the Philadelphia-based company’s chemicals in the production of paint and coatings, electronics, household products, detergents, personal care goods, water treatment products, adhesives, plastics, and salts.

Rohm and Haas stresses innovation in its 140 research and manufacturing sites around the globe. As a partner with the Office of Energy Efficiency and Renewable Energy (EERE), the company has performed plant-wide energy efficiency assessments in its Knoxville plant and elsewhere to identify cost savings potential.

The Rohm and Haas facility in Deer Park, Texas, is the company’s largest monomer manufacturer, accounting for 35 percent of all Rohm and Haas corporate energy use. In 1996, a plant-wide assessment identified 125 areas in which the plant could implement cost-saving best practices. Over the past 6 years, EERE’s BestPractices energy management techniques have reduced overall energy use at the facility by 17 percent and saved the company an average of \$15 million per year. In February of 2001, the Deer Park facility was named runner-up for the EERE’s 2001 Plant-of-the-Year award.

In addition to its BestPractices efforts, Rohm and Haas is a member of several EERE initiatives, including:

- Initial Vision2020 Challenge
- BestPractices for Steam
- Vision2020 Steering Committee.





SECAT President and CEO with Denise Swink and DOE Industries of the Future staff at Allied Partnership signing event

As an Allied Partner, SECAT applies and promotes EERE programs and services to assist its

members in the achievement of their long-range energy reduction, pollution abatement, and economic goals.

SECAT, Inc. is a research consortium dedicated to facilitating cutting-edge research and development of innovative technologies and products for the aluminum industry. SECAT was established in August 1999 in Lexington, Kentucky, and became the first Aluminum Industry of the Future (IOF) Allied Partner in November 2001.

SECAT provides financial, project, and intellectual property management for aluminum research projects. SECAT and its sixteen aluminum industry members, in partnership with land grant universities, other academic institutions, and national laboratories, have quickly established their places as collaborative partners with DOE's Office of Energy Efficiency and Renewable Energy on research and development of innovative processing technologies for the aluminum industry. SECAT, Inc. currently partners with EERE on four projects that include over 13 industries, three national laboratories, and two university partners. SECAT is an active participant in updating the Aluminum Vision. It is a leader in the Kentucky State IOF program.

As an Allied Partner, SECAT applies and promotes EERE programs and services to assist its members in the achievement of their long-range energy reduction, pollution abatement, and economic goals. SECAT helps increase awareness of and disseminates EERE resources and information. SECAT encourages BestPractices energy assessments and training opportunities and facilitates the dissemination and replication of assessment results and recommendations throughout the industry. SECAT builds awareness of EERE to the aluminum and aluminum casting industries by promoting appropriate EERE emerging technologies through its Web site and other communications methods that focus on improving energy-efficiency. SECAT promotes and assists in planning Showcases to highlight energy efficiency technologies and best practices, and encourages its members to participate in updating the Aluminum Industry Vision and Roadmaps.

SECAT actively participates in EERE's State Industries of the Future Programs in those states where its member companies have production facilities for the manufacture of primary aluminum, semi-fabricated aluminum products, and aluminum castings.

SECAT conducts R&D for improving energy efficiency in aluminum melting.



Silver Eagle refines crude oil and markets refined petroleum products, including various grades of gasoline, kerosene, diesel fuel, waxes, and asphalt. It processes approximately 10,000 barrels per day of crude oil.

Silver Eagle was one of three Utah refineries to open its doors during the 2001 Utah Showcase. The technologies on display at Silver Eagle highlighted the advantages of government-industry cooperation. They also showed how EERE resources such as *3E Plus* insulation evaluation software and pump assessments can impact the operations of a refinery. The success of the technologies in use at the refinery encouraged attendees to adopt these innovations in their own facilities.

Silver Eagle showcased six different applied technologies and best practices at the Showcase. Together these technologies have resulted in



Silver Eagle Facility Manager Gil Higham introduces a new energy-saving catalyst technology at the 2001 Utah Showcase

The technologies on display at Silver Eagle highlighted the advantages of co-operation between government and industry.

increased product yield of approximately one and a half percent, reduced energy use by more than 175 billion Btu per year, reduced operating costs by more than \$700,000 per year, and reduced carbon dioxide emissions by more than 10,000 tons per year. The technologies that produced these results include a boiler that uses waste heat, a new catalyst that reduces the use of platinum catalyst by two-thirds, an improvement to tank insulation using DOE's *3E Plus* software, and the applied results of a DOE pump assessment. The facility also showcased two emerging technologies: a cryogenic cooling system, which will improve waste stream recovery; and a waste heat recovery system, which will reduce the fuel required for steam production.



The Sacramento Municipal Utility District (SMUD) has been an active Allied Partner for years. Sacramento's industrial customers have adopted many of the energy and cost saving strategies fostered by DOE's Office of Energy Efficiency and Renewable Energy (EERE). Industrial programs that contributed to the intense conservation efforts of 2001 included numerous compressed air and motor system workshops and seminars hosted by SMUD's Energy & Technology Center (E&TC) and the Commercial Services Department. These included Energy Management for Water and Wastewater Treatment Plants, two Motor Systems Management workshops, a workshop on Correction of Existing Compressed Air Systems, and *Pump System Assessment Tool* workshop. These events rely heavily on materials and expertise available through EERE programs.

Lighting, architecture, manufacturing, and industrial processes are also featured in workshops throughout the year at the E&TC. The E&TC enables customers to take advantage of energy-efficient design, equipment, and facility management practices. Seminars are also offered on advanced processes that improve their bottom line and enhance their competitiveness.

A primary means of assisting industrial customers is the performance of system audits. SMUD maintains a staff of Commercial Services Account Representatives, assisted by other trained professionals, to assist customers in managing their energy use through retrofit projects. Compressed air and other motor system audits have resulted in a number of energy saving projects. Projects in 2001 included conversion of an electric boiler humidification system to air atomization,

resulting in annual savings of 2.36 GWh and 637 kW on this project. SMUD is a member of the Consortium for Energy Efficiency (CEE), and participates in a number of CEE managed programs, including the Motor Decisions Matter campaign.

SMUD's industrial customers have adopted many of the energy and cost saving strategies fostered by DOE's Industrial Technologies Program.

SMUD was a proud supporter and participant in the first Energy Solutions for California Industry, held in August in Sacramento, an energy event organized by EERE and the California Energy Commission. Other events where EERE materials were featured and made available to customers included the Sacramento Plant Engineering and Maintenance Show and Conference.



Spirax Sarco has 3,900 employees in 32 countries who provide expertise and products for safe control and efficient use of steam and other industrial fluids. Through its mutually beneficial Allied Partnership with DOE's Office of Energy Efficiency and Renewable Energy (EERE), Spirax Sarco has distributed EERE Tip Sheets and Case Studies in over 80 percent of the training it conducts. (Two case studies highlight Spirax Sarco customers). Through its globally distributed *Spirax Sarco News*, the company has published six articles highlighting EERE and BestPractices Steam to raise awareness nationally and in European efficiency programs.

Spirax Sarco integrates EERE information and products in its workshops. Spirax Sarco also includes EERE personnel in its workshops given to individual customers, often firms with multiple plants. Additionally, Spirax Sarco's all-day workshops for organizations such as the Association of Energy Engineers feature EERE personnel and state representatives and other BestPractices Steam partners, such as the National Insulation Association and ONDEO Nalco. New fruitful working partnerships for Spirax Sarco and further communications with individuals at national laboratories, Industries of the Future Teams, and BestPractices have revealed new resources and champions that strengthen Spirax Sarco's marketing and credibility.

Spirax Sarco is presently co-developing software for a Steam Systems Awareness program. Previously it helped develop EERE's Steam Scoping Tool software. The forthcoming Steam System Awareness Tool will help plant managers determine project priorities for plant improvements while taking into account costs, emissions, reliability, and efficiency for a variety of options. Spirax Sarco is also developing accompanying training aids to augment those already being used (e.g. a video on internal boiler operation) by nearly all of EERE's Industrial Assessment Centers.

Glenn Hahn, Energy Services Group Manager, has been an extremely active partner with EERE's BestPractices. He currently Co-Chairs the BestPractices Steam Technical Subcommittee and serves on the BestPractices Steam Steering Committee Executive Board. Glenn also Chairs the BestPractices Steering Committee, represents BestPractices Steam on the Committee, and has served on the Editorial Board for EERE's Energy Matters newsletter.



Spirax Sarco Headquarters

Through its globally distributed *Spirax Sarco News*, the company has published six articles highlighting EERE and BestPractices Steam to raise awareness nationally and in European efficiency programs.



Steel Manufacturers Assoc.

The Steel Manufacturers Association (SMA) brings together 57 North American companies that operate more than 130 steel plants and employ approximately 120,000 workers, as well as nine member companies outside of North America. In 2000, the SMA membership accounted for 59 percent of domestic carbon steel manufacturing and included a number of integrated (ore-based) steel makers and producers of hot-rolled steel products. The organization is the primary trade association for scrap-based electric arc furnace (EAF) steel makers.

The SMA focuses its activities in the areas of international trade, environmental control, energy policy, workforce matters, new materials, and products and technology. Towards that end, the association engages in a range of collaborative research projects in partnership with the Office of Energy Efficiency and Renewable Energy (EERE).

As an EERE partner, the SMA lends its industry expertise to EERE-sponsored studies that analyze energy use and emissions in steel-making processes to establish baseline data that will provide the foundation for future energy savings and productivity improvements in the U.S. steel industry. The association provided input into the development of the *U.S. Steel Industry Technology Roadmap* and currently collaborates with EERE on other ongoing projects:

- Improving Refractory Wear of Furnaces—Working to extend the refractory service life of EAFs and achieve additional goals in metallurgy, noise suppression, and energy savings. Projected benefits include reduced refractory consumption per ton of steel produced and increased reuse of materials and energy efficiency
- Fellowship Cooperative Education Initiative—Leading the design and establishment of a cooperative education program for selected college students who have completed the first or second year of a 4- or 5-year program. Selected students will participate on projects designed to increase their interest and experience in the steel industry. Projected benefits include an increased number of college graduates entering the steel industry and a more experienced entry-level steel industry workforce.

The SMA seeks a grass-roots involvement with the federal government as a way of advancing our segment of the steel industry. Partnerships with offices such as EERE are important to our goals.
—Tom Danjczek
SMA



Superior Aluminum

The Superior Aluminum Company has championed the Metal Casting Industry of the Future (IOF) since its inception. Moreover, Superior has implemented many of the results and process improvements resulting from Metal Casting IOF research leading to opportunities for improved energy efficiency and productivity. As a champion of the Metal Casting IOF, Superior has consistently shared and disseminated the results of metal casting research at national conferences and other events. Superior demonstrates to the industry the value of participating in this industry-government partnership and applying clean and energy efficient technologies on the plant floor.

Superior has enthusiastically dedicated the time and expertise of its employees to participating in EERE activities. The success of EERE's partnership with Superior is due in large part to the dedication and hard work of Dwight Barnhard who led Superior and now shares his time as Executive Director of the American Foundry Society. Mr. Barnhard signed the original metal casting industry Compact, which established the partnership between DOE and industry. He has been instrumental in all facets of this successful partnership since its implementation, participating on both the Industrial Advisory Board and the Industrial Oversight Panel. In this role he has provided expert insights on technical R&D and helped to ensure a balanced portfolio focused on improving energy efficiency in the industry. He was a key individual in hosting the "Future Think Forum." It was at this forum that over 30 industry leaders came together and provided critical insight into stating the various challenges that face the metal casting industry as a whole. The Forum laid the groundwork for the updated Metal

Casting Vision and new industry Compact. The continued partnership with Superior is helping to lead the Metal Casting IOF into the 21st century.

Superior has enthusiastically dedicated the time and expertise of its employees to participating in EERE activities.



The Technical Association of the Pulp and Paper Industry (TAPPI) and EERE have a long-standing relationship dating to 1994 that included the early development of the Forest Products Industry of the Future Agenda 2020 activities. They took that relationship a step farther on March 6, 2002 with the signing of an Allied Partnership agreement. As Allied Partners, TAPPI and EERE will work together to help the pulp and paper industry capture a part of the large energy savings opportunities that exist within mills throughout the United States, and to help focus the industry on issues such as energy and environmental concerns.

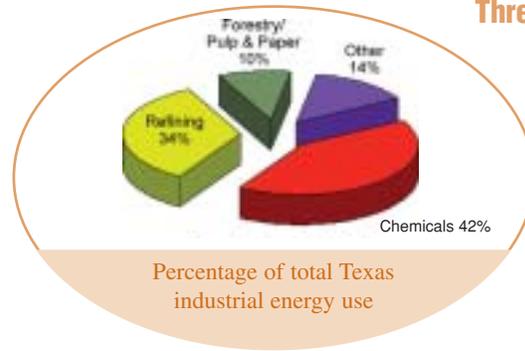
In May 2001, TAPPI, DOE and the American Forest and Paper Association co-sponsored the Forest, Wood, and Paper Industry

TAPPI and EERE will work together to help the pulp and paper industry capture a part of the large energy savings opportunities that exist within mills throughout the United States, and to help focus the industry on issues such as energy and environmental concerns.

Technology Summit. A group of 147 pulp and paper industry experts gathered to determine the path for research to be pursued under the Agenda 2020 program to deliver commercially viable systems by 2008. The industry's vision is that integrated paper manufacturing will one day require no fossil fuel energy and even be a net exporter of electricity. Efforts currently underway as a result of this conference will provide the direction for an effective, industry-led public/private partnership for many years to come.

TAPPI is helping this partnership come to life by communicating Summit results through publications and conferences so it reaches the largest possible audience in the most efficient way. A series of articles on the technical and direction-setting substance of the Summit began running in the TAPPI journal *Solutions!* in September 2001 and will continue in the months to come.

Most recently, TAPPI and EERE created the Energy Results Showcase, held March 5-7, 2002, with presentations and sessions in Atlanta and a DOE showcase at Augusta Newsprint in Augusta, Georgia. The two groups identified topics and coordinated promotion efforts to deliver a complete program focused on methods to manage and lower energy costs.



Three IOF sectors account for 86 percent of industrial energy use in Texas, which accounts for 20 percent of all energy used by industry in the United States.

The Texas Industries of the Future (IOF) program, sponsored by the Texas Energy Coordination Council, leverages the programs and tools of the U. S. Department of Energy's Industries of the Future. Three IOF sectors, chemicals, refining, and forest products, account for 86 percent of the energy used by industry in Texas, and Texas industrial energy use accounts for 20 percent of all energy used by industry in the United States.

Texas IOF activities include:

- Forming an executive steering committee early on, consisting of industry and academic advisors in chemicals, refining, forest products, and agriculture.
- Introducing national and state IOF programs to 75 attendees from industry, academic institutions, and government agencies at a two-day conference, which included roadmapping R&D needs (May 2001).
- Organizing a Texas IOF and EERE conference on energy efficiency strategies and emerging technologies to reduce NOx emissions from industrial facilities (July 2001). EERE contractors introduced a model that incorporates best energy management practices into a facility's NOx reduction strategy. To follow up on this very positive reception, Texas IOF will develop a computerized tool to assist facility engineers to evaluate tradeoffs among technology capital and operating costs, NOx reductions, and energy usage.
- Publicizing Texas IOF Best Practices training sessions to its mailing list and through trade associations. The training sessions are well received by industry.
- Holding a 1-day workshop held in February 2002 with the Texas forest products industry to identify needs. One of the group's conclusions was that the Texas forest products industry would benefit from cross-industry interaction.
- Planning a Texas Technology Showcase to be held in March 2003 in Houston that will focus on energy-efficient technologies and best practices that reduce NOx and VOCs in the chemical and refining industries.

**The Timken Company's
commitment to energy conservation
makes partnerships with outside
organizations necessary to achieve
broad-based conservation objectives.
—William A. Fladung
The Timken Company**

The Timken Company's commitment to innovation in the area of energy conservation drives the company's involvement in partnerships with outside organizations. Timken serves a leadership role in strategic planning initiatives to further broad-based energy reduction efforts throughout the steel industry. Timken Project Manager of Process Technology, Dr. Robert V. Kolarik, currently chairs the American Iron and Steel Institute's (AISI) Strategic Planning for R&D Group, which advises AISI's Committee on Manufacturing Technology.

Timken also engages in several collaborative partnerships with the Office of Energy Efficiency and Renewable Energy (EERE), including revising and re-issuing the *U.S. Steel Industry Technology Roadmap*. The company participates in eight projects funded by the U. S. Department of Energy, including demonstrations of a newly developed off-gas sensor for electric-arc furnaces at its Faircrest Steel Plant in Canton, Ohio.

Timken collaborates with EERE on other projects including:

- **Laser Ultrasonic Technology**—Developing laser ultrasonic technology to measure the wall thickness of seamless mechanical steel tubing for use by mill operators in process control. Projected benefits include increased yield, reduced scrap and rework, and annual savings of \$4 million.
- **Controlled Thermo-Mechanical Processing**—Developing controlled thermo-mechanical processing technology in steel production to reduce heat-treatment cycles through control of the microstructure of steel. Projected benefits include more efficient processes and annual savings of \$16 million.

The Timken Company is a leading international manufacturer of bearings, alloy, and specialty steels and components, as well as related products and services. The company employs approximately 18,900 associates in 24 countries around the globe.

Over a century after its founding, the United States Steel Corporation remains the largest integrated steel producer in the United States. Headquartered in Pittsburgh, Pennsylvania, the company manufactures and sells a wide variety of steel sheet, plate, tubular and tin product, coke, and taconite pellets to customers around the world.

To maintain its station as an industry leader, the U.S. Steel invests heavily in advanced technologies and continuous improvements in its operations. Working in conjunction with the Office of Energy Efficiency and Renewable Energy (EERE), the U.S. Steel conducted plant-wide assessments of energy use and implemented several improvement projects at the company's Irvin and Edgar Thomson Plants in Pennsylvania's Mon Valley. In 2001 the Edgar Thomson Plant was named the EERE Plant of the Year for its energy conservation improvements.

**In 2001 the Edgar Thomson Plant
was named the EERE Plant of the
Year for its energy conservation
improvements.**

In addition to these efforts, the U.S. Steel was the leading contributor to the development of the *U.S. Steel Industry Technology Roadmap*, with U.S. Steel representative Mark Atkinson co-chairing the project.

The company is also a participant in several collaborative projects with EERE:

- **Blast Furnace Hot Oxygen Injection**—Collaborating on an effort to develop a system for direct injection of hot oxygen into blast furnaces to create improved mixing and combustion conditions for blast furnace coal injection. Projected benefits include reduced operating costs, energy consumption, and emissions, and savings of \$2.24 million/year per furnace.
- **Increased Uniformity of High-Strength, Low-Alloy Sheet Steels**—Helping to investigate the factors that reduce variability in yield strength and grain size of hot-rolled steel to strengthen the market for high-strength, low-alloy sheet steels, which are used primarily for automobile parts. Projected benefits include improved production yield and quality, and resulting savings, and increased fuel efficiency in automobiles.

The theme of Utah Industries of the Future award-winning Web site (www.uiof.org) is “What IF.” We have been asking industries “What IF you had a clear vision of the future? What IF you had a technology roadmap to take you there? What IF you could reduce your steam costs by 20 percent? What IF?”

The Utah Industries of the Future (Utah IOF) is working on the ground in Utah to develop partnerships to turn these and other possibilities into realities. Since its launch in November 1999, Utah IOF has delivered training and workshops, sponsored meetings and conferences, provided technical training, developed leadership partners, and assisted with the Utah 2001 Industry Showcase. Early industry assessment identified the mining and metals industries as key components of Utah’s IOF industries. The Utah Mining and Processing Industries Collaborative (UMPIC) is working to address the needs of these industries (www.umpic.utah.edu).

In January 2001, Utah IOF and UMPIC hosted an Industry Roundtable which brought together high-level participants from crosscutting industries. The crosscutting format—including coal mining, metals mining and refining, petroleum, metal casting, steel, cement, and other large Utah industrial businesses—was based on the advice and suggestions from the industries themselves. Participants representing 23 industries ranged from the President of Andalax Coal, to the Director of Engineering and Technology at Geneva Steel, to the Director of



Industry leaders address Utah congressional representatives at a field hearing during the Utah 2001 Industry Showcase

What IF you had a clear vision of the future? What IF you had a technology roadmap to take you there? What IF you could reduce your steam costs by 20 percent? What IF?

Technology for Kennecott Utah Copper. All the participants said that the roundtable was “worth my time.” Comments included, “The most valuable aspect of the roundtable was the cross-company (industries) information passed and discussed.”



Virginia Polytechnic Institute and State University (Virginia Tech) Department of Mining and Minerals Engineering is home to two major mining and energy research centers. These are the Virginia Center for Coal and Energy Research (VCCER) and the Center for Advanced Separation Technologies. Major areas of research include:

- Mining Systems Simulation
- Virtual Reality Applications in Mining
- Energy Planning and Management
- Rock Mechanics and Ground Control
- Solid-Solid Separation
- Solid-Liquid Separation
- Environmental Management and Control.

Research in these areas is helping to improve safety, energy efficiency, productivity, and environmental performance in the mining industry.

Virginia Tech brings this technical expertise to the Mining Industry of the Future partnership on a number of R&D programs. For example, Dr. Erik Westman of the Department of Mining and Minerals Engineering assembled an outstanding project team to develop and test innovative engineering tools to improve coal recovery. These tools include R&D with technologies to perform imaging ahead of mining and sensors to perform real-time stress measurement. These technologies have the potential to reduce mining costs, improve mine safety, and reduce energy requirements.

Virginia Tech is also leading R&D on cyclone technologies to improve energy efficiency in separating coal and minerals from ore. As a result of the Mining IOF collaborative partnership with Massey Coal, Precision Testing Laboratory, and Partition Enterprises Ltd., Dr. Gerald Luttrell of the Department of Mining and Minerals Engineering is implementing new operating and maintenance standards for the coal industry.

Michael Karmis, Stonie Barker Professor of Mining and Minerals Engineering and Director of the VCCER, is a State IOF champion in Virginia and at the national level. As president of the Society for Mining, Metallurgy, and Exploration, Inc., Dr. Karmis is working closely with EERE to communicate Mining IOF research priorities. Through a State IOF grant, Virginia Tech is holding seminars for the Virginia mining industry on energy management, reforestation, environmental remediation, novel training concepts, mining systems optimization, and implementation of fuel cell technologies in underground mining. This work supports vital technology transfer from research institutions to industry.



Bank of three dense medium cyclones in operation at a coal preparation plant

Virginia Tech is helping to improve safety, energy efficiency, productivity, and environmental performance in the mining industry.



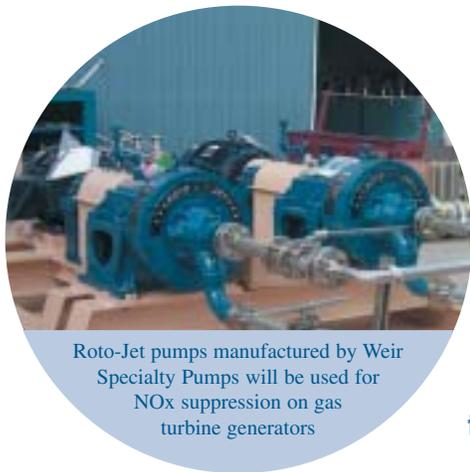
Weir Specialty Pumps

Weir Specialty Pumps™ (WSP) is part of the WEIR Group PLC in Glasgow, Scotland. The Group, founded in 1871 and today one of the world's top pump manufacturers, has nearly 10,000 employees with an extensive global network of manufacturing plants and service operations. The Group serves a number of global markets including power, oil/gas, water/sewage, marine, minerals processing, and general industrial.

Headquartered in Salt Lake City, Utah, Weir Specialty Pumps has been providing the world with specialized pumps and equipment for nearly a century. Municipal waste water and sludge, power generation, chemical processing, pulp and paper, phosphate and fertilizer, oil drilling, food handling, and high-pressure cleaning are just a few of the many industries served by Weir Specialty Pumps products.

Through its partnership with DOE, Weir Specialty Pumps has promoted energy efficiency in a number of ways in the past 3 years:

- In December 1999, WSP co-hosted a *Pump Systems Assessment Tool (PSAT)* workshop in Houston.
- In April 2001, Tom Angle, Director of Engineering and R&D, participated in PSAT training to become certified as a Qualified PSAT Specialist.
- In June 2001, Weir Specialty Pumps became an Allied Partner with the DOE's Office of Energy Efficiency and Renewable Energy (EERE).
- In November 2001, WSP co-hosted a PSAT workshop in Baton Rouge, Louisiana, distributing 50 copies of the DOE Decision Tools CD.
- During the past 3 years, WSP supported Mr. Angle's efforts as one of the editors of the Hydraulic Institute's *Pump Life Cycle Costs: A Guide to LCC Analysis for Pumping Systems* guide.
- WSP is in the process of making major design changes to its Roto-Jet® line of pumps, significantly increasing hydraulic efficiency and reducing energy consumption. This effort will be completed in 2002.



Roto-Jet pumps manufactured by Weir Specialty Pumps will be used for NOx suppression on gas turbine generators

Through its partnership with DOE, Weir Specialty Pumps has promoted energy efficiency in a number of ways in the past 3 years.

Weirton Steel

Founded in 1909, the Weirton Steel Corporation is the nation's seventh largest integrated steel company and second largest manufacturer of tin-plated steel. The company embraces innovation and partnerships dedicated to the advancement of the industry, including collaboration with the Office of Energy Efficiency and Renewable Energy (EERE) in a range of activities.

In May 2000, Weirton partnered with EERE in a demonstration of energy efficiency and productivity advancements in the Pittsburgh Regional Technology Showcase. The company provided guided tours and technical presentations of the cutting edge technologies in use at its Weirton Steel Plant. The plant tours demonstrated how EERE-supported R&D and BestPractices are increasing the energy efficiency of steel production and improving its quality.

More recently, Weirton has undertaken a number of EERE-supported efforts directed at improving energy efficiency in its operations, including:

- Plant-wide Energy Efficiency Assessments—Evaluating its plant processes to uncover areas in which modifications in procedures or technologies could improve energy efficiency in the areas of compressed air system design, utilities automation, and water pumping. Projected benefits include: \$1 million/year from improved utilities automation and at least \$150,000/year from reconfigured compressed air systems.
- Infrared-based Steel Strip Preheating—Working with the Oak Ridge National Laboratory to implement a system using infrared technology to preheat steel strip entering the furnace. Projected



Weirton's Dave Yegeol (l) and Rick Martin (r) observe a slab exiting hot mill reversing rougher.

When spot natural gas prices hit \$10 per thousand cubic feet not too long ago, we were very lucky to have a project pipeline and network of technology support already in place.
—Phil Elbaz
Weirton Steel

- benefits include reduced energy use and increased throughput.
- Boiler Panel Overlay—Weld-overlaying boiler panels with new materials that will improve overall boiler efficiency and greatly reduce maintenance requirements. Projected benefit include savings of \$5.2 million in operating and maintenance costs.

In addition to these projects, Weirton is currently investigating efficiency improvements through the use of innovative materials in galvanizing pot hardware and recycling and/or marketing iron-bearing mill wastes, among other areas.

WEIRTON
STEEL CORPORATION

The West Virginia Industries of the Future (IOF) program was established in 1997 by West Virginia University and a coalition of industry and state government representatives. The initiative is part of DOE's Office of Energy Efficiency and Renewable Energy's (EERE) States Industries of the Future program, which aims to increase industrial energy efficiency by encouraging and sponsoring collaborative R&D partnerships at the local and state levels.

The West Virginia IOF has developed industry-specific roadmaps that identify critical paths for adopting energy efficiency and pollution-control strategies, increasing asset productivity, and strengthening the state economy. As a result of these roadmaps, industry members are participating in energy-saving projects worth over \$13 million. The

The West Virginia effort is considered a "model" State IOF program because it was well-conceived and has been energetically implemented by



From Left: Denise Swink, Carl Irwin, Governor Underwood at MOU signing event

members of West Virginia Industry and academia.

West Virginia IOF is focused on the steel, aluminum, glass, chemical, forest products, mining, and metal casting industries. The West Virginia effort is considered a "model" State IOF program because it was well-conceived and has been energetically implemented by members of West Virginia Industry and academia. The program has gained strong support from prominent federal, state, and local officials such as Senator Jay Rockefeller, West Virginia Governor Cecil Underwood, and the President of West Virginia University David Hardesty, Jr. Most importantly, the West Virginia program is considered successful because it has produced quantifiable energy-savings for state industry. At the last symposium, in December 2001, the state signed a Memorandum of Understanding (MOU) with DOE to formalize and celebrate the West Virginia IOF. Because the West Virginia program has been so effective, other states are using the program as a guide.

The West Virginia IOF has resulted in numerous benefits for the state. One benefit has been retention of industry in the state, which is at risk due to increasing global competition. The West Virginia IOF is the foundation of the state's technology-based industrial retention activities because identifying and implementing new technologies are key to keeping a strong manufacturing base in the state.

In 1994, the forest products industry signed a compact with EERE and the industry's technology visioning process, Agenda 2020, was born.

In 1994, the forest products industry signed a Compact with DOE's Office of Energy Efficiency and Renewable Energy (EERE) and the industry's technology visioning process, Agenda 2020, was born. Weyerhaeuser scientists, engineers, and executives have participated in all of the six task groups of Agenda 2020 and have provided leadership to five of these during much of this period. Currently the Sustainable Forest Productivity, Environmental Performance, and Recycling task groups are co-chaired by Weyerhaeuser staff as is the Chief Technology Officers Committee.

Weyerhaeuser has benefited in many ways from this important partnership. In 1994, the company received a grant from DOE to study the possibility of locating a biomass gasification combined cycle technology at its mill in New Bern, North Carolina. As part of the same study the potential of producing ethanol from biomass was also thoroughly evaluated. A follow-on grant in 1996 focused on a detailed feasibility study of the gasification plant and scoped the conditions that would be necessary for such a project to be economically sustainable. The results of this effort are still used as a primary reference for evaluating possible gasification applications in Weyerhaeuser mills.

In 2001, Weyerhaeuser began to work with DOE in carrying out thermal and electrical conservation assessments. Currently, two assessments are underway at mills in Longview, Washington and Plymouth, North Carolina. The company is an active participant in DOE's BestPractices activities and has taken advantage of best practice training in selected areas. An Allied Partner agreement is currently under consideration in order to allow a wider dissemination of the products offered by EERE.

Most recently, the company has cooperated with EERE in hosting a Washington State Industry of the Future event at its technology center in Federal Way, Washington. Since the mid-seventies the relationship between Weyerhaeuser and EERE has been an excellent example of an effective and efficient partnership between industry and government that has benefited Weyerhaeuser, its customers, and its stakeholders.





Valri Robinson, DOE Industrial Technologies, at the Wisconsin Forest Products Roundtable

The IOF provided an outreach model to help us get our industrial programs off the ground quickly.
— Preston Schutt
Wisconsin Division of Energy

Shortly after Wisconsin became a State Industries of the Future (IOF), the state government was given the responsibility for promoting energy efficiency—a task usually performed by public utilities. The change was timely, according to Preston Schutt of the Wisconsin Division of Energy. “The IOF provided an outreach model to help us get our industrial programs off the ground quickly,” he said. Key to the effort is promoting DOE’s office of Energy Efficiency and Renewable energy (EERE) BestPractices to Wisconsin’s industries. “Our goal is to work with our firms to institutionalize energy efficiency best practices. We will also work with suppliers to ensure the marketplace provides those goods and services,” said Schutt. “We’re about to kick this effort into high gear.”

Wisconsin began its state IOF program by focusing on metal casting and forest products, two of its largest industries. About 80 of the state’s 260 metal casters came together for the first time to create a roadmap with 14 action items. Enthusiasm was so high for one item that work began right away. About 10 small foundries are working to pool their waste foundry sand to attain sufficient volume and consistency for aftermarket uses. This pilot project could lead to other regional collaborations where several foundries band together to provide sand suitable for reuse in asphalt production. This could save significantly on disposal costs and landfill space.

The first forest products roadmap sessions brought together more than 40 representatives, whose effort resulted in its completion at the end of 2001. Partnerships forged at the meeting have already led to the submission of a number of proposals to EERE’s NICE³ technology demonstration grant program, one of which won funding in 2002 for an alternative biopulping process.

In 2001, Wisconsin received funding to begin work on the state’s agriculture industry, and they hosted their first biotech roadmapping session in March, 2002. Biotechnology is a growing industry in the state with more than 3,000 organizations in the Madison area alone. Future plans for Wisconsin IOF include expanding participation in other key industries such as glass and chemicals, with the state also working on non-IOF projects in the printing, food processing, and plastics industries.

The Center for Heat Treating Excellence (CHTE) located at Worcester Polytechnic Institute (WPI) is dedicated to the advancement of heat-treating processes through collaborative research and development in accordance with the Heat Treating Technology Roadmap and the Current R&D Plan and Vision 2020 Document. Both of these documents were established through industry workshops sponsored by DOE’s Office of Energy Efficiency and Renewable Energy. The Center was established in 1999 within the Metal Processing Institute (MPI) at WPI as an alliance between the industrial sector consisting of heat treaters, heat-treating suppliers and manufacturers of industrial products, and university researchers.

The Center for Heat Treating Excellence (CHTE) located at Worcester Polytechnic Institute (WPI) is dedicated to the advancement of heat-treating processes through collaborative research and development in accordance with the Heat Treating Technology Roadmap and the Current R&D Plan and Vision 2020 Document.

MPI’s vision is to be the premier university-based research facility dedicated to advancing the state of the art in near-net-shape manufacturing. Through its focus on metal processing, MPI brings fundamental understanding to existing processes, develops new methods, and addresses management-technology interface issues with input from its industrial partner. The CHTE member companies define and direct the needed research, whereas the WPI faculty members, and their respective research team members, address fundamentals that are needed to establish the knowledge base for the heat treating sector.

CHTE develops innovative processes to control micro-structure and properties of metallic components, reduce energy consumption, reduce process time, reduce production costs, achieve zero distortion, increase furnace efficiency and achieve zero emissions. The Center’s consortium funded and launched four research projects in year 2000. These are: Analytical Tools for Parts Loading Design and Temperature Control; Quenching Control Process; Distortion and Residual Stress Control; and Solution Heat Treatment of Aluminum Alloys. The following two new projects were added to CHTE’s research portfolio in 2002: Quenching—Understanding, Controlling and Optimizing the Process, Phase II; and Enhancement of the Computer-Aided Heat Treatment Planning System. Visit www.wpi.edu/+mpi for more information.



Profiled Partners

Profiled Partners

Advanced Ceramics Research, 2	Kaeser Compressor, 22
AIChE, 2	Kennecott Utah Copper, 22
Air Products and Chemicals, Inc., 3	Kentucky, 23
Alcoa, 3	Maine, 23
Alliance to Save Energy, 4	Mercury Marine, Brunswick, 24
Aluminum Association, 4	MTI, 24
AMCAST, 5	NASEO, 25
American Iron and Steel Institute, 5	National Corn Growers Association, 25
American Petroleum Institute, 6	National Mining Association, 26
Applied Proactive Technologies, 6	NIA, 26
ASERTTI, 7	NPRA, 27
Augusta Newsprint, 7	Northeast Utilities, 27
Boise Cascade, 8	Owens Corning, 28
Cargill Dow, 8	PPG Industries, 28
Cast Metals Coalition, 9	Praxair, 29
Chevron, 9	Rohm and Haas Company, 29
Commonwealth Aluminum, 10	SECAT, 30
Compressed Air and Gas Institute, 10	Silver Eagle, 30
Compressor Distributor Association, 11	SMUD, 31
ConservAIR, 11	Spirax Sarco, 31
CONSOL Energy, 12	Steel Manufacturers Association, 32
Delphi Automotive, 12	Superior Aluminum, 32
Dow Chemical, 13	TAPPI, 33
Dupont, 13	Texas Energy Coordination Council, 33
Emerson Electric, 14	The Timken Company, 34
Energy Center of Wisconsin, 14	U.S. Steel, 34
Energy Research Company, 15	Utah, 35
Fairbanks Morse, 15	Virginia Tech, 35
Flying J Refinery, 16	Weir Specialty Pumps, 36
FMC Corporation, 16	Weirton Steel, 36
Forging Industry Association, 17	West Virginia, 37
Gas Technology Institute, 17	Weyerhaeuser, 37
GMIC, 18	Wisconsin, 38
Hitchiner, 18	WPI, 38
Hydraulic Institute, 19	
Idaho, 19	
IHEA, 20	
Imerys, 20	
Iowa State University, 21	
ITT Industries, 21	





About the Office of Energy Efficiency and Renewable Energy (EERE)

Through partnerships with industry, government, and non-governmental organizations, the office develops and delivers advanced energy efficiency, renewable energy, and pollution prevention technologies for industrial applications.

EERE encourages industry-wide efforts to boost resource productivity through the Industries of the Future (IOF) strategy. The industry-led IOF strategy focuses on these energy and resource intensive industries:

Agriculture	Forest	Metal Casting	Steel
Aluminum	Products	Mining	
Chemicals	Glass	Petroleum	

These nine industries account for more than 80 percent of the manufacturing sector's energy use. In addition, they account for more than 80 percent of the volume of all waste and pollution generated in manufacturing, and about two-thirds of all pollution control expenditures in manufacturing.

To help industries begin saving energy, reducing costs, and cutting pollution right away, EERE offers a comprehensive portfolio of emerging technologies, practices, tools, information, and resources in a variety of application areas. Visit our Web site at www.eren.doe.gov to find out more about EERE and how your company can get involved.

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About BestPractices

BestPractices is part of the Industries of the Future (IOF) strategy. BestPractices assists the nine Industries of the Future—agriculture, aluminum, chemicals, forest products, glass, metal casting, mining, petroleum, and steel—in identifying and realizing their best energy efficiency and pollution prevention options from a system and life-cycle cost perspective.

Through activities such as plant-wide energy assessments, implementation of emerging technologies, and energy management of industrial systems, BestPractices delivers energy solutions for industry that result in significant energy and cost savings, waste reduction, pollution prevention, and enhanced environmental performance. In addition, EERE's Industrial Assessment Centers provide comprehensive industrial energy evaluations to small and medium-size manufacturers.

BestPractices also works with an extensive network of Allied Partners to help deliver energy efficiency information to industry. Allied Partners enhance the IOF strategy by working with these industries to adopt proven technologies and best energy management practices.

BestPractices offers a wide range of resources—software, training, tip sheets, case studies, sourcebooks, and a bi-monthly newsletter—to industry on how to take advantage of energy and cost saving opportunities in their facilities.

To learn more about BestPractices, visit our Web site at www.oit.doe.gov/bestpractices.

For Additional Information Please Contact:

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Page 1, Industry executives at Utah Showcase; courtesy of Rolf Butters, DOE.

Inside Back Cover, Left, Biomass power plant; courtesy Wheelabrator Shasta Energy Co., PIX 07163.

Inside Back Cover, Right, Flying J staff, Utah Showcase; courtesy Rolf Butters, DOE.

Outside Back Cover, Denise Swink, DOE, and TAPPI President Mike Wallace; courtesy Grace Ordaz, DOE.





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