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CLASS OF 2011

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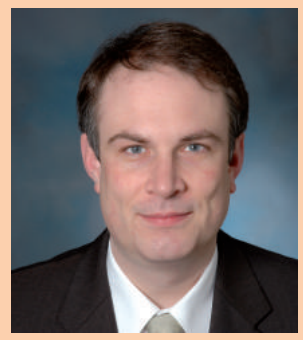












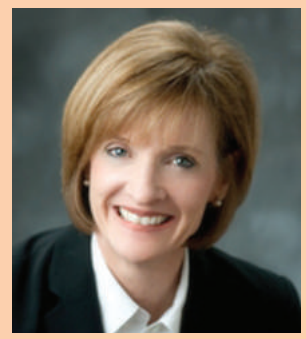

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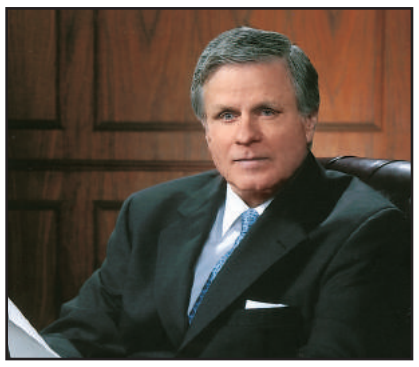

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BPA WORLDWIDE BUSINESS

In the Oscar nominated movie, "The King's Speech", Colin Firth acts out the King's stammer with the memorable line "because I have a voice!" Voices were heard from Tahrir Square in Cairo.

In publishing, we give a voice to our contributing editors and in this issue to the Class of 2011.

We are pleased and proud to present our 12th Class of the millennium.

Alasdair Cathcart was recently named President of Bechtel's Power Global Business Unit overseeing fossil, nuclear, renewables, and transmission and communications. "Bechtel is rightly known for project focus," he says on page 4, but he's driving a culture to motivate discretionary performance.

Power generation facilities are among the biggest industrial users of fresh water, Heiner Markhoff, President and CEO of GE Water and Process Technologies, stated on page 5. GE is doubling R&D investments in new water-management technologies to increase water reuse and recycling.

J. T. Grumski joined SAIC in 1997 and has led the development of SAIC'S energy strategy and successful acquisition of the Benham Companies and R.W. Beck. He spells out his customers' challenges and offers technically sound and financially feasible solutions on page 6.

Dr. René Umlauft has served as Chief Executive Officer of Siemens Renewable Energy since 2008. He sees renewables accounting for up to 17 percent of the 2030 market. Siemens has tripled its R&D wind power budget in the last two years, expressed on page 7.

Rolls-Royce provides a diverse yet integrated product portfolio of power solutions. Looking into the future, Mr. Athanasia sees Rolls-Royce investing in renewables and fuel cell technology, on page 8.

Dr. Song Wu is Director of Advanced Technologies for Hitachi Power Systems America based in Basking Ridge, NJ. He is responsible for advancing the company's core technologies and planning for technology and product strategy described on page 9.

In three years, Ralf Sigrist has grown Nordex USA to 180 employees and built a new 150,000 square foot wind turbine manufacturing plant in Arkansas. His hiring goal is 800 people and he sees the states' Renewable Energy Standard (RES) imminently doable on page 10.

Craig Arnold is spearheading Dow's comprehensive strategy of energy efficiency and CO^2 management. Dow has invested $1 billion in industrial energy efficiency programs for its own operations and is collaborating with Alstom on CCS outlined on page 11.

Michael Howard, President and CEO of Electric Power Research Institute says that the preeminent challenge facing the electricity sector is to produce power in a cleaner, near-zero emission generation fleet and deliver it over an interactive electric grid. He lists seven major focus areas EPRI is working in on page 12.

The US solar market doubled in 2010 and Sharp's market share is 15 percent, Eric Hafter who heads up Sharp Solar Energy Solutions Group observes on page 13. SEGS is launching new products this summer.

Privately held Mortenson Construction Company has emerged as one of the leading renewables contractors in North America, Jerry Grundtner underscores on page 14. In 2010, Mortenson added 62 employees to its renewable group.

Schott has been manufacturing components for the solar industry since 1958, Tom Hecht, President of Schott Solar PV shared. Schott commissioned its third Solar Barometer in 2010 which is summarized on page 15.

Bob Bibb had worked on over 1,500 assignments for 500 clients in half a dozen countries and 40 states over 20 years before selling Bibb and Associates to Kiewit in 1998. He recently formed Bibb-EAC and shares his future plans on page 16.

Tendril secured 20 smart grid pilot programs in 2010 in 14 states. What Tendril learns will be critical to the rollout of the Smart Grid on a broad scale, CEO Adrian Tuck asserts on page 17.

Over half of Honeywell's portfolio is linked to energy efficiency. Jeremy Eaton reports on page 18 that increasing attention is being paid to energy efficiency and demand management resulting in smart grid related projects.

As things stand now, the supply chain is inadequate to reach many nations' 2020 renewable targets. Scaling up will not be easy and is dependent on continued availability of subsidies, but should present many opportunities, Jane Allen of Deloitte predicts on page 19.

Barry Worthington has been Executive Director of the United States Energy Association, directing the Association's domestic and international activities since 1988. USEA will continue its mission to bring about a greater understanding of energy issues, Mr. Worthington said on page 20.

Jerry Robinson offers an overview of power industry staffing and recruitment including his views on the industry's current status, future needs and his insight on high-impact issues the industry faces on page 21. Mr. Robinson is Managing Partner of Strategic Contract Resources.

As 2011 gets underway, PIC's Todd Grzech believes that technology is the key. We need to create an environment where information and knowledge is at the fingertips of every field employee, he suggests on page 22.

MyCelX provides clean water technology solutions and operates in 10 countries, CEO Connie Mixon tells us on page 23. MyCelX was a finalist for the Sustainable Technology Innovation of the Year Award at the 2010 Platts Global Energy Awards.

Dick Flanagan

ALASDAIR CATHCART

Alasdair Cathcart is President of Bechtel Power Global Business Unit

Alasdair Cathcart is a Scotsman who grew up near Glasgow. He received his engineering education at Heriot-Watt University in Edinburgh, graduating with honors and a B Sc degree in Civil Engineering. He has worked at Bechtel for 22 years in such places as the Middle East, Africa, Eastern Europe, and the United Kingdom. He was recently named president of Bechtel's Power Global Business Unit, assuming his responsibilities January 1. As president of the Power GBU, Cathcart oversees its four business lines: Fossil, Nuclear, Renewables, and Communications & Transmission. He has full responsibility for the GBU's operations, including business development, project execution, customer satisfaction, and unit profitability.

Previously, Cathcart was the president of Bechtel's Fossil Power division, preceded by working as the project director of Bechtel's massive Elm Road Generating Station project on the shores of Lake Michigan in Wisconsin. This was a 1,230 MW coal-fired supercritical power station built by Bechtel for Wisconsin Energy. Cathcart also held the position of president of Bechtel Construction Operations Incorporated, where he managed Bechtel's direct-hire, equipment operation, and construction management processes around the world.

Cathcart was the project director for the Croatian Motorway and project manager for the UK Channel Tunnel High Speed Rail Link project. In all, he has experience in four major Bechtel business lines: Civil; Power; Oil, Gas & Chemicals; and Mining & Metals. World Generation recently sat down with Alasdair Cathcart in his Frederick, Md., offices and learned about his views on Bechtel's projects and strategies.

COMMUNICATIONS & TRANSMISSION

A Communications & Transmissions business line was established in the Power GBU over a year ago. "We did this for a reason," Cathcart says. "We could see from the projections of the power industry that almost as much investment was necessary on transmission and distribution as on generation. We determined that we could add value to our customers by offering a dedicated project management focus on the transmission and distribution of power as separate standalone projects."

Cathcart points out that Bechtel had performed transmission work in its past but not worked on large projects of this sort recently. To quickly revitalize the talent and skill set for this new business line, Bechtel turned to its experience in the communications business. A long time standalone business, Communications has had the processes for working with complex logistics, mobile work crews, rights-of-way, and erecting towers. In its years of providing services to the communications industry, Bechtel has refined its engineering, procurement, and construction skills by building a vast infrastructure. "When we looked at Communications and the tools, processes, and procedures developed to be successful in that business, those capabilities were the most like what we would need for building transmission towers and routing wire," Cathcart says. "What we decided to do was bring the communications business and transmission business together with the Power GBU, which of course would also put them in closer contact with people working on the generation projects. The president of the former Communications business line now heads up Communications & Transmissions. This is a bit of a new focus for us, a new market, but we are very keen about it and look to be a bigger player here going forward." Cathcart says he is hoping to sign up at least one large transmission project in North America this year.

FOSSIL POWER

The Fossil Fuel division comprises five market segments: Solid Fuel; Natural Gas; IGCC; Emissions Retrofit; and Operating Plant Services. Cathcart pointed out that Bechtel's large solid-fuel projects that spanned the last five years are coming to an end. Bechtel turned over Unit #1 of the Elm Road project a year ago and Unit #2 very recently. Elm Road is a 1230 MW supercritical pulverized coal plant. Cathcart says Bechtel is very proud of its performance there, having constructed what he called one of the most efficient coal plants in the nation.

But he acknowledges that domestically the development of coal plants faces difficulties and that in the United States natural gas is the more likely choice for the foreseeable future. "The switch from coal to natural gas is the dominant driver in our Fossil business," Cathcart says, "and maybe in the whole power industry. Even though new supercritical technology is 30% more efficient and produces far less CO2 than older coal generating facilities, the uncertainty of carbon tax and regulation, I think gives utilities pause. They will weigh investments in emissions retrofit, waiting to see how regulation is going to fall, against building with natural gas given the prices we have now."

Also worthy of note are the Sammis emissions retrofit project in Ohio, which removes 95% of SO2 from pre-retrofit levels, and the Prairie State campus southeast of St. Louis. Prairie State is about 65% complete. Cathcart's group will turn over the first unit at the end of this year and the second and final unit in the summer of next year; when complete, the plant will be one of the cleanest solid fuel plants in the nation. Under the natural gas market segment, Bechtel is building the Russell City combined cycle project for Calpine southeast of San Francisco. Cathcart's group has just begun the foundation work.

Internationally, Cathcart sees many opportunities for Power. This applies not only to the Fossil division but to other divisions as well. "This is something I am going to be focusing on," he says. "Bechtel works in many places around the world, while we have been active in several international locations, Power has concentrated in North America because of the large and complex projects it has been doing here." He sees the shift away from coal to natural gas in North America echoed in other parts of the world, and he makes a special point of noting the UK – "There is a big gas market in the UK that we are entering," he says. "We completed four gas projects in the UK in the early part of the decade. We are leveraging our long term presence in London and we are increasing our Power offices there to help support our power projects in the UK and Europe."

Elsewhere, Bechtel is exploring other opportunities to put to use its experience in solid fuel plant construction. A particular country of interest is India, which will be commissioning plants both inland – near mine mouths where the coal is – and along the coast, where the plants are likely to be importing Australian and Indonesian coal. But Cathcart is quick to point out that just as Bechtel wants to be diverse in North America, so does it want to be flexible abroad. And he sees trying to establish a better presence in South America. He points out that Bechtel has a strong presence there with its Mining & Metals GBU. "We are already working with M&M, to see if there are ways Power can get back into South America in a significant way," he says.

NUCLEAR

Cathcart's nuclear group has three primary market segments: New Generation; Major Modifications; and Operating Plant Services.

Under New Generation, Cathcart's workload includes planning and engineering for new nuclear power plants and a significant amount of work restoring and completing previously idled units including the Watts Bar Unit 2 work in Tennessee, where the reactor was begun but then put on hold for 20 years. Cathcart's group is doing the engineering, procurement, and construction at Watts Bar, working to bring the unit online next year.

Work has started on the engineering for the proposed third reactor at Calvert Cliffs, Maryland. Cathcart admits that this project has been "challenged" – Constellation Energy withdrew from UniStar Nuclear Energy – and France-based global energy company EDF remains the sole sponsor of the project. It would be the first EPR reactor in the United States. Says Cathcart: "EDF has continued with their application for a combined operating and construction license for the project. Given the need for DOE loan guarantees, NRC approval of the project and technology, and over 70% engineering before notice-to-proceed, this development is going to take some time; the pace is going to be slow." New Generation also includes licensing support for seven new nuclear projects in the U.S.

Cathcart's group is also working in the small modular nuclear reactors (SMR) field. Here Bechtel entered into a relationship last July with Babcock & Wilcox (B&W) as the principal partner and developer of mPower, B&W's 125 MW small modular nuclear power reactor technology. "There is a lot of development work to go," admits Cathcart, "but we are looking to it as a long-term solution. We think SMRs may be a solution for our clients to bring nuclear into their fuel mix without having to wrestle with the significant front end investment associated with large plants. We feel very positive about mPower, albeit as a medium- to longer-term play. We are working with B&W to secure the design certification and develop projects."

Major Modifications and Operating Plant Services jobs are key for continuing to sustain Bechtel's nuclear talent. Owing to the lack of new nuclear construction in the United States over recent decades, holding onto nuclear talent and skill sets is difficult. But it can be done with the Major Modifications and Operating Plants work. Cathcart says Bechtel has done well in this regard: "Obviously nuclear projects take a long time designing and permitting, but you have to have good people and skills ready to go. When these major projects are suddenly ready, we just can't snap our fingers and hope to have the right people, skills and supply chains. We are actively looking to attract, recruit, and retain nuclear talent. We've been doing this well for over 25 years with our Major Mods and Operating Plants work. We've completed over 30 steam generator replacement projects, are currently supporting over half a dozen extended power uprate projects and continue to provide operating plant services to plants in the U.S. and abroad. You have to have a business strategy that includes developing this talent, and that is exactly what we've been able to do."

RENEWABLES

Bechtel worked on some early solar and wind projects in the 1980s and '90s but has not been as active in the Renewables market for the last several years. That ended in a big way with the award of the BrightSource Ivanpah project in southeast California. The 370MW, three unit solar-thermal project uses thousands of heliostats focusing light on three boilers atop central towers that produce steam for driving electric generators. When completed it will be the world's largest solar thermal project and effectively double the U.S. solar ther-

(continued page 8)

HEINER MARKHOFF

Heiner Markhoff is President and CEO of GE Water and Process Technologies

REDUCING WATER USE IN POWER PLANTS SAVES MONEY, IMPROVES OPERATIONAL EFFICIENCY AND BENEFITS THE WORLD

Power generation facilities are among the biggest industrial users of fresh water, and that's a big challenge because the world is running out of it.

It's easy for those who have never faced water scarcity to take fresh water for granted, but the reality is that the world's fresh water supplies are under extreme pressure. Indeed, one of the mega-trends sweeping the globe is that demand for both water and energy is projected to grow at an alarming pace. Global energy demand is projected to double and water demand to triple in the next 20 years, driven by population growth and industrial development.

About 20 percent of the world's fresh water is used for industrial purposes, including for power generation. In the United States that rate is closer to 45 percent. Outside the United States, the world's developing regions account for a large and increasing portion of electric power demand, yet according to the United Nations Development Program, more than one billion people, or about one in six worldwide, already lack access to safe drinking water, while more than two billion lack access to adequate sanitation.

Water is required in virtually every aspect of producing electricity. An average 1,000-megawatt power plant with a cooling tower withdraws about 30 million gallons of water daily, and the U.S. power sector withdraws an average 201 billion gallons per day (GPD) from the nation's fresh water supplies.

If current water usage trends continue, by the year 2025 two-thirds of the world's people won't have enough clean water. Clearly, things simply can't continue on the current trajectory.

Compounding the problem, the drive to reduce greenhouse gas emissions often conflicts with the need to conserve water. Here are some examples. A solar thermal system has a minimal carbon footprint but consumes more than six times the water a coal-fired plant of the same power output requires. Also, a coal-fired power plant with carbon sequestration will see a six-fold reduction in carbon emissions, but also will use twice the water in generating the same amount of power.

Additionally, new nuclear plants will be built with cooling towers, which consume at least three times more water than a once-through cooling system and a geothermal power plant consumes almost ten times more water than a coal-fired unit.

Natural gas is an excellent fuel choice for future power-generation applications, emitting less than half the carbon of a comparably-sized coal plant. However, the production of gas from unconventional geologic formations to meet this future demand is water-intensive. NOX and SOX reduction typically employs wet scrubbers, which are highly water-intensive. Air pollutants are not eliminated from the stack, they are just transferred from the air to the water where they must then be removed and treated. It is estimated that it could take as much as 3,000 gallons of water to produce a gallon of biofuel.

Increasingly, people are coming to see that energy production has a close, interdependent relationship with water. Simply put, water is required in the production of energy, and energy is required to produce and transport usable water. They are inseparable. Currently 4 percent of the U.S. energy grid is consumed by water treatment and conveyance.

ATTRACTIVE SOLUTIONS EXIST

The good news is that commercially available, cost-effective solutions exist that enable the power industry to play a leading role in addressing the world's water problems while enhancing their own productivity and reducing total operating costs.

New water-management technologies greatly reduce water use and costs for power plants by enabling greater operational efficiencies and the capability to reuse and recycle cooling water. Modern technologies also enable plants to run safely on lower-quality, less-expensive water sources such as effluent from municipal wastewater systems.

Much of the water used in generation is for cooling, so a key strategy is to optimize the cooling system. Cooling water requires multiple chemical treatments to keep corrosion, deposition and microbiological fouling at bay, which otherwise would impair system efficiency, potentially harm capital equipment and people, and increase total costs.

The problem is that water-treatment chemistries continually change as the cooling water evaporates. Operators attempt to maintain them by blowing down, or bleeding off, some of the cooling water and topping off the system with fresh water. This typically is performed essentially in trial-and-error fashion, using educated guesswork based on water samples that are hours or days old. It limits the amount of times water can be recycled through the system, is costly, wasteful and chances are the cooling system isn't operating at peak performance at all times.

GE's revolutionary TrueSense* technology platform gives users a precise way to monitor and control open evaporative cooling water systems. It combines direct online monitoring of water chemistries with handheld instrumentation to dramatically cut offline testing time, and with a powerful data analysis/display capability that renders deep insight into system status.

TrueSense can yield estimated total operating cost savings of 25 percent or more when enabled with the right treatment chemistry, such as GE's GenGard* with Stress Tolerant Polymer. In a moderately sized cooling tower in many areas of the United States, a cooling system running under optimal conditions which TrueSense enables could save nearly $400,000 per year in fresh water acquisition costs alone. Savings would be greater in regions where water costs are higher.

ULTRAFILTRATION ENABLES WASTEWATER USE

Meanwhile, effective filtration of both cooling water and boiler feedwater is key to the power sector's ability to increase water reuse and recycling and thereby benefit from reduced costs. It also provides the capability to profitably develop the energy infrastructure in regions with sporadic or uncertain fresh water availability.

The use of GE's ultrafiltration ZeeWeed membrane bioreactor (MRB) technology is mushrooming for power generation applications around the world. It incorporates hollow fiber membrane filters that replace conventional methods and combine clarification, aeration and filtration into a simple, cost-effective process that reduces capital and operating costs.

ZeeWeed reliably turns the most complex wastewater streams into consistently high-quality water that far exceeds even the most stringent regulations, and is suitable for any reuse or disposal application.

One way many users are employing GE ZeeWeed technology to benefit the power sector is to harness municipal wastewater to provide for industrial needs, including power plants. Rather than municipal wastewater plants simply treating and discharging water back to a receiving stream, an incremental GE ZeeWeed treatment process can be added either at the wastewater plant or at the power plant to reuse this water.

One example is the city of Tempe, Arizona's Kyrene Water Reclamation Facility, which employs GE's ZeeWeed MBR technology. Tempe is in the heart of the U.S. Southwest, a region constantly battling drought and water shortages. Thanks to ZeeWeed, the Kyrene facility's capacity has been doubled from 4.5 to nine million gallons of water a day, with a peak flow of 11.7 million gallons, making it one of the largest MBR plants in North America.

This additional water is supplied for cooling to the power plant serving the city, where it is further treated with a reverse osmosis/demineralization system prior to use in the cooling system. Other uses for the water include helping to refill the town lake and irrigation at city recreational centers. The local utility benefits in other ways, too, in that because water is such a costly commodity in Tempe, the ability to reuse wastewater profitably makes the city more attractive to businesses, allowing it to expand its economic base, which in turn leads to more revenues for the utility.

MEETING WORLDWIDE WATER CHALLENGES

These examples show that as the world faces growing water scarcity challenges, GE is making the necessary investments in technologies to meet the challenges of today and tomorrow. GE is doubling R&D investments for water and continues to develop advanced technologies for wastewater treatment and reuse. We work everyday with customers to reduce water consumption per MW produced.

It's part of our commitment to address global mega-trends related to water availability, quality, environmental issues and energy-efficient technologies. GE continues to work with industry leaders, educators and policy makers worldwide to proactively tackle these challenges and to help further solutions, policies, technologies and fiscal issues needed to ensure an adequate supply of clean water for the future.

In 2011, GE Power & Water will carry forward its commitment to address pressing water availability and quality issues, not only through advanced and innovative technology solutions, equipment offerings and deep applications and project experience, but also by helping to drive new regulations and to shape effective public policies.

GE remains committed to being a part of the total solution, and is heavily involved in educating the world about the importance of water recycling and management. GE representatives will continue trekking the globe to work with industry professionals, associations, educators, nongovernmental organizations and governments to help shape policy and spread the message of working together for the greater goal of water reuse.

HEINER MARKHOFF BIO

Heiner Markhoff is president and chief executive officer of GE Water & Process Technologies. The company brings together experienced professionals and advanced technologies to solve the world's most complex challenges related to water availability and quality, increased productivity and cost reduction, and environmental regulations. A 15-year GE veteran with extensive international business experience, Heiner has been in his new position since October 2008.

Heiner began his career as an associate with Booz Allen & Hamilton, a strategy and technology consulting firm. He joined GE's Corporate Business Development Team in Fairfield, CT in 1994, and in 1995 he was appointed marketing manager for GE Silicones Europe, based in Bergen op Zoom, The Netherlands. In this role he was responsible for product management, marketing and business development activities, which led to the formation of GE Bayer Silicones in July 1998. Heiner was named commercial director of the new business.

CLASS OF 2011

J.T. GRUMSKI

J.T. Grumski is the President of SAIC Energy

WORLD-GEN: PLEASE SHARE YOU PLANS AS PRESIDENT OF SAIC ENERGY, ENVIRONMENT AND INFRASTRUCTURE?

J.T. Grumski: Our mission is to provide innovative, integrated solutions to our customers' energy, environmental, and infrastructure challenges. To do that, we provide solutions for every phase of the business lifecycle. SAIC acquired The Benham Companies in 2007 and R. W. Beck in 2009 and integrated their capabilities with SAIC's existing expertise. We obviously have aggressive plans to grow this business and have taken a very thoughtful and strategic approach based on our customers' challenges and business needs. Their challenges are really becoming much more complex and inter-dependent, and they are increasingly constrained by resources—both capital and natural—across the board. Many of our customers are losing a lot of critical skills such as knowledge and capacity to integrate and implement solutions. This is often because of either downsizings or just baby boomer retirements. More and more they're relying on companies like SAIC to have a broader depth of capabilities across the lifecycle. We're tackling problems that have national importance, like ensuring a clean, reliable and secure energy supply in this country. We're implementing an efficient energy delivery system that will help spur the growth that it did in the first part of the century. We're really trying to move and provide not only technically sound but financially feasible solutions to upgrade infrastructure, restore the environment and try to ensure we've got sufficient natural resources both in terms of clean air and water. We have a very consistent strategy across SAIC, and we're taking a bigger view and focusing on the integration of our lifecycle capabilities and transforming them into customer solutions that are more powerful than the sum of the individual parts.

WORLD-GEN: PLEASE TELL US WHO SAIC'S CUSTOMERS ARE?

J.T. Grumski: We have a diverse set of customers that include commercial businesses like Wal-Mart and Chevron. We have a number of banking customers and institutional customers. We provide consulting and engineering services for branches of state and local governments. We work for many of the utilities, both investor owned and public power, and of course our federal DOD and DOE customers, so we really cover the gamut of customer segments. I believe our diverse customer base is one of the things that has helped SAIC be fairly stable during the recent market downturn. We were able to shift businesses and customer focus and maintain good financial performance.

WORLD-GEN: WOULD YOU CONSIDER SAIC AN EPC FIRM?

J.T. Grumski: SAIC certainly has EPC as one dimension of our business. We have a very high-end consulting business that does due diligence for the financial community. We can approach the market from the architect, independent/owner's engineer, or design perspective. We can approach it from design-build, and we can also approach it from a design-build-finance-own transfer model. Because our customers' challenges are often multifaceted and complex, SAIC has to be able to provide services in each of those practices or market areas and bring them together in a very flexible, adaptable form to fit whatever the situation calls for. We're not one dimensional. SAIC actually is a very interactive and dynamic organization that brings together the right people, technology, and systems for our customers, leveraging and transferring knowledge to meet their needs better than our competitors.

WORLD-GEN: WHAT COUNTRIES DOES SAIC WORK IN?

J.T. Grumski: We've done projects in more than 40 countries. We don't have a large employee population in any one country outside of the United States. We do have project offices in several other countries and are expanding into international business, but from a revenue standpoint, we are dominated by U.S. revenue at present.

WORLD-GEN: WHERE ARE YOU EXPANDING?

J.T. Grumski: The Middle East is one area that we're expanding our energy and environmental services to. Sustainability is becoming much more prevalent in the Middle East, and they are meeting the intersection between energy and water head on. In addition, we are expanding our energy efficiency work to South Korea. We are also on the Island of Guam with both the build-out of the U.S. Department of Defense and the infrastructure needs of that island in terms of energy and water.

WORLD-GEN: WHERE ARE YOU WORKING IN THE MIDDLE EAST?

J.T. Grumski: Most of our consulting business right now is targeted in Saudi Arabia. We also have some environmental work in Kuwait. I suspect it will expand. An example would be the recent announcements in Qatar for supporting the 2021 games there. There is a lot of expansion going on in the Middle East in infrastructure. Although it has slowed during the economic crisis, it's coming back.

WORLD-GEN: IS SAIC DOING WORK IN EUROPE?

J.T. Grumski: We are doing some activities in Europe, primarily around energy, IT business, and some nuclear facilities, but it's not extensive.

WORLD-GEN: IS SAIC INTERESTED IN GEOTHERMAL PROJECTS IN THE U.S.?

J.T. Grumski: SAIC won two large geothermal projects in 2010, and we have a very healthy pipeline. We have one project with U.S. Geothermal, another with Terra-Gen, and a number of projects that we are in the process of either bidding on or negotiating. Our pipeline is very full with geothermal.

It doesn't require large scale government help. It's a base load renewable. I think as the technology has improved to extract more energy out of less quality heat sources, it is essentially becoming a go-to kind of renewable. We look at Nevada and Idaho, where there are untapped resources and good availability for transmission. It just makes economic sense to have something that isn't dependent upon the next Congressional action.

WORLD-GEN: WHAT OTHER RENEWABLES IS SAIC WORKING ON?

J.T. Grumski: SAIC has experience with all commercially viable renewable technologies. We do engineering and technology assessment work in the solar and wind area. The Avenal solar project in Kings County, California, which we worked on, won a Renewables Deal of the Year award from Project Finance International. We do independent engineering, owners engineering, and asset transaction work incorporating many different renewable energy technologies. As far as design build, we're sticking mostly in geothermal, biomass and looking at some solar thermal or solar gas hybrid type facilities.

WORLD-GEN: IS SAIC ADDING EMPLOYEES TO THE STAFF?

J.T. Grumski: Most certainly. We're in a constant state of hiring. We have more than 3,000 staff in the energy, environment, and infrastructure business now in more than 50 locations. To build our capabilities we are in active pursuit of acquisitions, which would not only expand our capabilities and geographic reach, but also our ability to solve our customers' energy, environmental, and infrastructure challenges.

WORLD-GEN: WHERE DOES SAIC SEE FUTURE INVESTMENTS?

J.T. Grumski: The grid and even our generation capacity has been under-invested in, and there's a whole paradigm shift going on with renewables. Renewables place a lot of stress on the grid in terms of the quality and the reliability of the power. A lot of end users are becoming producers, so you have industrial parks, military bases, and campuses that generate power. They are looking to put in microgrids to become somewhat independent of the grid. So again, a whole new equation is developing around how you manage power and power flows. On top of that, if you look at electric cars, that is going to place an incredible amount of demand on how we charge those cars and conversely how we may use the power out of those cars as back-up generators, versus having diesel generators. While the new paradigm starts to come about with all new challenges to maintain reliability and the delivery that we've become used to, these investments have to be made. They're good investments because they will create domestic jobs and technology, and it's going to be good for the country.

J.T. GRUMSKI BIO

J.T. Grumski is President of SAIC's Energy & Infrastructure subsidiary as well as being named General Manager of the Energy, Environment and Infrastructure (E2I) Business Unit on June 2008. The Subsidiary and Business Unit have over 3,500 staff providing full life-cycle of services for commercial, utility, federal and state customers. He has served in increasing positions of responsibility with SAIC over the past 12 years including President of the Benham Companies LLC, and Chairman of the Board of R.W. Beck, both SAIC subsidiaries.

Grumski began his career with Gulf Oil Company in 1980 and over the next 17 years he progressed through senior level engineering, operations management, and program management positions with Westinghouse Electric and Lockheed Martin Corporation. He has extensive experience in managing major plant operations, engineering and system integration programs for commercial, utility and federal customers.

Since joining SAIC in April 1997, Grumski has managed major programs, served as president and on the board of directors of two acquired subsidiaries, served as SAIC's Chief Corporate Engineer and was a Managing Director for the Bechtel-SAIC Yucca Mountain Project from 2004 through 2008. He has led the development of SAIC's energy strategy and successful acquisitions of the Benham Companies and R. W. Beck which are both part of the current business unit he manages.

Grumski is the recipient of key engineering & management awards including the SAIC Environmental Excellence Award, Westinghouse Special Management Award, two George Westinghouse Signature Awards of Excellence, and a Y-12 National Security Complex Management Operations & Support Award. Mr. Grumski holds a BSME and MSME and was selected and completed the first SAIC Chairman's Program for executive leadership. He is a registered professional engineer and certified project management professional through the Project Management Institute.

DR. RENÉ UMLAUFT

Dr. René Umlauft is CEO of Siemens Renewable Energy Division

WORLD-GEN: WHAT IS SIEMENS DOING IN THE FIELD OF RENEWABLE ENERGY? WHAT IS THE GROWTH POTENTIAL OF THE INDUSTRY?

Dr. Umlauft: We see a huge potential for renewables. In 2010, 4 percent of worldwide power generation came from renewable energy. That number is expected to rise to 13 to 17 percent by 2030, with both emerging as well as developed markets contributing to the growth. Half of the growth is expected to come from wind power, more than one third from solar.

Our focus is on wind and solar energy and we believe that we have the right solutions. With 30 years of experience in wind power, Siemens has an unparalleled track record with an installed base globally of more than 9,600 turbines with a combined capacity of more than 13,000 MW. Our target is to become a top 3 supplier for wind turbines globally by 2012.

Siemens also offers large-scale rooftop and ground-based photovoltaic power plants in the capacity of an EPC contractor. For concentrated solar power plants, we are able to supply 70 percent of all individual components required, including the steam turbine and solar receivers.

WORLD-GEN: WHAT ABOUT YOUR GLOBAL FOOTPRINT? ARE YOU EXPANDING YOUR MANUFACTURING CAPABILITIES?

Dr. Umlauft: In the next two to three years we expect to have 12 wind power manufacturing facilities in seven countries, up from seven wind power manufacturing sites in three countries right now. We will have new wind turbine production facilities in Canada, the United Kingdom, India and a joint venture for component manufacturing in Russia.

Just two months ago, in December 2010, we celebrated the grand opening our new 300,000-square-foot nacelle assembly plant in Hutchinson, Kansas, as well as our first blade manufacturing facility in Shanghai, China. And that same week we announced that we will open a new wind turbine blade manufacturing facility in Tillsonburg, Ontario, Canada.

WORLD-GEN: WHAT IS THE BIGGEST CHALLENGE THE INDUSTRY IS FACING?

Dr. Umlauft: Renewable energy is still heavily dependent on policies that support its development. Therefore, it is necessary to have stable framework conditions in place to encourage investment in renewable energy sources. In order to reduce the dependency on government incentives, Siemens continues to optimize its production systems and project logistics and is heavily investing in R&D to improve turbine performance and to reduce the overall cost of wind-generated energy. For example, we have tripled our wind power R&D budget over the last two years and we'll continue to increase it significantly in 2011. Our mid-term objective with wind power is to achieve full whole sale parity with fossil fuels. We have the same target for solar power. Renewable energy needs to be cost competitive with conventional power generation.

WORLD-GEN: CAN YOU TALK ABOUT TECHNICAL INNOVATIONS IN WIND AND SOLAR POWER?

Dr. Umlauft: Innovation is a key element of our growth strategy. The new direct drive wind turbine sets a new standard in wind turbine technology. The SWT-3.0.101 with a rated power output of 3 megawatts (MW) has half the parts of a conventional geared wind turbine and features lower weight as part of its advanced engineering design. It is expected to require less maintenance and to help increase profitability for our customers.

Siemens also built the first floating offshore wind turbine in Norway in 2009 with Statoil (Hywind). This technology broadens the market potential for offshore even more and can be used for water depths of up to 700 meters.

In solar, Siemens holds a 45 percent share in the Italian company Archimede Solar Energy, a manufacturer of molten-salt receivers. This allows operation with temperatures as high as 550 degrees Celsius, which increases the efficiency of CSP plants significantly. If necessary, the molten salt can also be used as heat storage. The energy stored can then be used for power generation at night.

Additionally, Siemens Energy holds a minority stake in Britain's Marine Current Turbines, a pioneer and technology leader in the design and development of tidal current energy turbines. With this investment, Siemens entered a new market with good business prospects.

WORLD-GEN: WHAT ARE YOUR TARGETS FOR YOUR WIND BUSINESS?

Dr. Umlauft: Based on a record order backlog of EUR10 billion and the expansion of our international manufacturing network, we expect to reach our goal to become one of the top 3 wind turbine suppliers by 2012. In 2010, Siemens reached the number two position in the U.S. and we intend to maintain it in this important market.

WORLD-GEN: HOW IMPORTANT IS THE U.S. FOR SIEMENS' RENEWABLES BUSINESS?

Dr. Umlauft: The U.S. is a very important wind market for Siemens. In the U.S. alone, there are 9,000 MW planned for large-scale photovoltaic plants, 12,000 MW for CSP plants and more than 50,000 MW for wind power.

The cumulative installed base of less than 10 gigawatts of wind power in 2005 rose to over 35 gigawatts in 2009 in the U.S., which represented a phenomenal 40% annual growth rate. However, 2010 finished with only half the installations of 2009 due to still challenging market conditions and the lack of a long-term, robust energy policy that supports clean energy production. This long-term policy commitment is necessary to drive demand and to encourage investment in manufacturing, supply chain and R&D.

However, despite the challenges, we've been increasing our manufacturing capacity with a clear focus on local content. An important milestone in our growth strategy in the U.S. was the official opening of our new wind turbine nacelle assembly facility in Hutchinson, Kansas, in December 2010. This investment, along with the other investments that were made to expand our wind business in the U.S., further demonstrates our commitment to U.S. and our confidence in the long-term future of the U.S. renewable energy market.

In the last five years, the U.S. market has represented more than 40% of Siemens' global installations. We have installed more than 4,300 MW of wind turbines in the Americas since 2006. And just recently we received our largest onshore wind order to date. Siemens will deliver a total of 258 2.3-MW wind turbines to MidAmerican Energy for several wind farms in Iowa. The combined capacity of 593 MW will be sufficient to supply 190,000 U.S. households with clean electricity.

WORLD-GEN: SIEMENS SAYS THE COMPANY IS THE MARKET LEADER FOR OFFSHORE WIND POWER GLOBALLY. ARE YOU INTERESTED IN OFFSHORE PROJECTS IN THE U.S. AS WELL?

Dr. Umlauft: The full wind potential in the U.S. is still largely untapped, especially offshore. A study published in September 2010 by the National Renewable Energy Laboratory (NREL) estimates the total U.S. gross wind resource offshore at more than 4,000 gigawatts. This is roughly four times the generating capacity currently carried on the U.S. electric grid.

We've certainly seen greater research and interest in the northeast region of the U.S. Because of our industry-leading position in offshore wind power development, Siemens was selected by Cape Wind to provide turbine equipment for its offshore wind project off the coast of Nantucket in Massachusetts. It will be the first one of its kind in the U.S.

WORLD-GEN: IN YOUR OPINION, WHAT NEEDS TO BE DONE IN THE U.S. TO INCREASE THE USE OF WIND POWER?

Dr. Umlauft: While the long-term outlook remains strong, the wind industry is currently facing some head winds. The most important challenge right now is the lack of a long-term, robust policy that promotes clean energy to ensure sustainable growth of the wind market in the U.S. Two of the most significant drivers have been the longer-term extension of the Production Tax Credit (PTC), along with the expansion of State Renewable Portfolio Standards, offered to the market during the last few years. PTC policies have experienced an unstable history without consistent, early renewals and some current State RPSs are not strong and large enough to support the current national wind market size. Based on current market conditions, it is therefore crucial to have clear policies that drive the long-term demand of wind energy in the U.S., enabling developers and utilities to develop successful, profitable wind power projects. There is also still a lack of financing, insufficient transmission capability, and low natural gas prices that make it more difficult for wind power to compete.

Despite these challenges, the long-term outlook for the wind industry remains positive. In order to maintain competitiveness of wind power, it is important to develop more efficient products that can harness the wind in an optimal way that reduces the overall cost of energy generated by wind. At Siemens, we have optimized our manufacturing process in order to maximize productivity in our facilities. We have also introduced new transportation methods and continue to innovate wind turbine blade design to increase power generation output.

WORLD-GEN: WHAT ABOUT SOLAR? IS THIS ALSO OF INTEREST IN THE U.S.?

Dr. Umlauft: Siemens has the most comprehensive portfolio in the concentrated solar power (CSP) business. Approximately 80 percent of all solar thermal power plants are parabolic-trough plants. This is a technology with a proven track record. The first CSP plants were built in the Mojave Desert in the U.S. and are still in operation. They have been generating electricity continuously for over 20 years. With the help of salt storage, CSP plants can also supply power at night. The U.S. is a very interesting market for CSP, especially in California. We also see great potential for photovoltaic in the U.S. We just recently received our first order to build a large-scale photovoltaic plant in New Jersey. We intend to open our global headquarters for our PV business in California to demonstrate our commitment to the U.S. PV market.

CHARLIE ATHANASIA

Charlie Athanasia is Executive VP for Power Generation, Rolls-Royce

Rolls-Royce is widely recognized for its technological leadership. Applying advanced technology to products and services is at the forefront of all Rolls-Royce businesses, and the energy sector is no exception.

With significant investments in energy solutions for global customers – in new products as well as product enhancements – Rolls-Royce is well-positioned to meet customer needs both today and tomorrow.

The enhancement and expansion of the Rolls-Royce power generation product portfolio has been driven by a dedicated push to remain at the technological forefront, and this has been achieved in large part by sharing the same knowledge, experience and innovation that has given Rolls-Royce its leadership position in the civil aerospace sector. This advantage is particularly effective today as global energy markets become more and more competitive, requiring equipment providers to produce increasingly reliable, technologically advanced and cost-effective power solutions. As will be explained later, the industrial Trent and recent introduction of the next evolution of the industrial RB211 gas turbine are clear examples of this.

Today, Rolls-Royce provides a diverse yet integrated product portfolio of gas turbine and reciprocating engine power solutions, ranging from the Trent 60 gas turbine at 64MW, to reciprocating engines with powers ranging from 10MW down to less than 2MW. At the same time, energy aftermarket products and services deliver a number of benefits to enhance performance of both new and existing equipment, providing customers with greater returns on their equipment investments.

Looking to the future, Rolls-Royce is also committed to developing technologies that will help meet the world's increasing requirement for clean energy.

THE INDUSTRIAL TRENT

The industrial Trent 60 is a fine example of shared technology from the aerospace sector. The most powerful pure aero-derived gas turbine on the market, the Trent 60, delivers up to 64MW in simple cycle service, at 42 per cent efficiency. It sets benchmarks for power output, fuel economy and cost savings, and is unparalleled in its power-to-density ratio while meeting stringent 25ppm NOx emission limits. Its high cyclic life and ability to go from cold start to full power in less than 10 minutes makes it an ideal solution for peaking and flexible power generation markets. This means it can add power to the grid very rapidly to compensate for the fluctuations and variability of some renewable and other power sources.

The inlet spray intercooling (ISI) for the Trent 60 that enhances power output and efficiency is an example of the Rolls-Royce commitment to product enhancement. The system uses inlet fogging and wet compression water streams, with the fogging array downstream of the inlet filters to maximize inlet air cooling and increase power.

Another Trent benefit is its modular design for quick installation and ease of maintenance. Each module is fully assembled and tested prior to customer shipment.

The Trent 60 range of power solutions starts at 51.5MW for a simple cycle Trent 60 Dry Low Emission unit and continues upward to 107.6MW for a combined cycle Trent 60 WLE ISI with supplemental firing. Efficiency rates are 42 per cent for simple cycle and up to 52.2 per cent in combined cycle.

THE RB211-H63

The RB211-H63 is yet another example of the transfer of proven technology in the aerospace sector to products for energy service. In this case, the transfer helps provide the next evolution of a highly respected industrial gas turbine, the RB211. This evolution includes major power and efficiency upgrades of the RB211 aeroderivative, with 11MW more power within the same footprint, along with efficiency up to 41.5%.

The RB211-H63 accomplishes this by combining the best technologies from the fleet of industrial RB211 and Trent units in service. When coupled with the new high-efficiency, high-speed RT63 power turbine, customers gain industry-best efficiency from a gas turbine in the 35MW to 45MW power range, filling a power gap in the industry not fully covered by other gas turbines.

INCREASING CUSTOMER VALUE

Customers for smaller-scale power generation products are benefiting, too, as Rolls-Royce introduces new technologies to its reciprocating engine product range. In the Bergen B-gas engine, for example, these technologies include an advanced thermodynamic cycle and turbochargers, and an optimized combustion chamber that contribute toward reducing emissions, increasing availability and lowering service cost per kWh. The B-gas engine's wide fuel-gas specifications, increased power and higher efficiency make it a class-leading product in the 2.0MW to 9.5MW range.

Higher standards of power, efficiency, life cycle costs and environmental performance also benefit the many operators worldwide of industrial Avon gas generators, which together have logged nearly 60 million operating hours. And again, advanced technologies developed for latest-generation civil and military aerospace engines are incorporated into the Avon 200 upgrade, which was introduced to the market in 2007. Using the Avon 200 upgrade, operators gain between 7.5 and 9.0 per cent more power at base load, better thermal efficiency, significantly lower CO and CO2 emissions, a 20 per cent increase in mean time between overhauls and reduced scope for overhaul work.

AFTERMARKET SOLUTIONS

As the individual needs of customers around the world continue to change and become more diverse, the energy business of Rolls-Royce has positioned itself as a global customer-focused organization that tailors its services to meet the unique needs of each individual customer. These service solutions range from the supply of spare parts… to equipment upgrades, enhancements and package refurbishments… to long-term service agreements (TotalCare).

Rolls-Royce TotalCare agreements are gaining significant popularity worldwide as equipment operators seek to minimize risk and attain the highest return for their equipment investment. Today, approximately 30 per cent of operators of industrial Avon, RB211 and Trent gas turbines, and Bergen reciprocating engines, have contracted with Rolls-Royce for TotalCare agreements to assure the highest performance of their equipment. And as in recent years, the strong growth of these agreements is expected to continue in the future.

Rolls-Royce technical support also represents a particularly powerful asset for operators. This technical expertise support extends through power project development, from initial conceptual work to construction and operation. It includes performance enhancement programs for gas turbines and combined cycle plants that draw on the technical gains achieved through extensive Rolls-Royce gas turbine research and development work, not only in the energy sector, but also in the aerospace and marine fields.

LOOKING TO THE FUTURE

Rolls-Royce is also active in exploring opportunities in low-emissions and alternative energy products. Renewables are now very much a key part of the energy mix.

Rolls-Royce has successfully tested a 500kW development tidal turbine off the northern coast of the UK, and plans are now underway to build a 1MW unit that will be the basis for a commercially available product.

Rolls-Royce also continues to invest in fuel cell technology.

ALASDAIR CATHCART

CONTINUED FROM PAGE 4

mal capacity. Cathcart's group has already fenced much of the site, is doing foundation work for the towers and is building the temporary facilities that will assemble the heliostats. "We are very excited about this project for BrightSource," says Cathcart. He adds that Bechtel's skill sets here have drawn from expertise learned on Bechtel solar projects in the past and will help propel the company to new Renewable projects in the future. "We are completing a small photovoltaic project now and are working to win a few larger ones as well as a couple of wind projects early this year," he adds. He says that this division's focus will likely be on solar and wind in North America for the immediate future but that the division is also looking at bio-mass projects and will selectively pursue renewables projects overseas.

MANAGEMENT STYLE

Asked about his management style, Cathcart says he is especially focused on people. "Bechtel is rightly known for project focus, effective procedures and processes, and the ability to manage complexity," he says. "Now we're extending our culture to broader levels of collaboration and accountability. By this I mean both inward-focused and outward-focused. I believe we can do better at collaborating with customers, partners, and suppliers to deliver the quality products and services for which Bechtel is well known. I am a firm believer that if we can focus on driving a culture that will motivate discretionary performance within the Power business it will benefit our customers, the industry, and ourselves. I want to instill a culture where people want to exceed expectations with the quality of our work, to where everyone is standing tall and wants to be accountable for their part of what we offer to clients. I don't believe in pointing fingers. I think that if there are challenges, people will stand up and be more accountable for solving them."

SUMMING UP

Cathcart is convinced that the energy appetite of the United States in the foreseeable future will best be satisfied with a mix of fuels: solid fossil fuel, natural gas, nuclear, and renewables. The same goes for markets overseas, where he hopes to spread and diversify the Bechtel brand. And he is determined Bechtel will be ready for any power skill set required. "We won't let our resources in any one field atrophy," he says. "We are ready and we will be ready for any opportunity."

DR. SONG WU

Dr. Song Wu is the Director of Advanced Technologies for Hitachi Power Systems America

Today the global power industry is facing many uncertainties such as the direction of new environmental regulations and the availability of unconventional energy resources. But it is certain that the industry is becoming cleaner, more efficient, more diverse and better connected.

Hitachi is working on many technology fronts to support the power industry during this time of change. We are actively pursuing renewable options such as wind, hydro, biomass, and related battery storage technologies. Through joint ventures with GE, Hitachi is poised to be a major player in the global nuclear renaissance. Hitachi's turbine/generator and steam generator products will serve the growing natural gas combined cycle market.

Coal contributes to about forty percent of the electricity generation in the world today and is expected to maintain its dominant share in the foreseeable future. Our technology development in clean coal technology is focused on the following areas:

INTEGRATED MULTI-POLLUTANT CONTROL

Hitachi has a complete portfolio of air quality control products. Hitachi developed its original selective catalytic reduction (SCR) technology in the 1960s and 70s and has supplied its catalyst for over 750 SCR units in power plants worldwide. Today Hitachi supplies both catalyst and the SCR systems in the North American market. The latest breakthroughs in the SCR catalyst technology are the TRAC® and the CM catalyst. The TRAC® (Triple Action Catalyst) not only maintains high NOx reduction, but also oxidizes mercury and suppresses SO3 formation, making the SCR a multi-pollutant control device without adding expensive equipment. The CM catalyst reduces plant operating cost by extending the catalyst life up to 32,000 hours, which is twice the typical life of conventional catalyst.

Similarly, the latest Hitachi wet FGD (flue gas desulfurization) scrubbers have the co-benefit of removing SO3, HCl / HF, particulate matter, and oxidized mercury, in addition to SO2. Hitachi is one of the first FGD suppliers to take the SO2 removal to 99+% levels. We have commissioned five FGD units in the Midwest U.S. and one in Minnesota within the past two years; all were tested with SO2 emissions well below 10 ppm. Such ultra-low emission level allows future CO2 capture system to be retrofitted directly, without adding an expensive flue gas polishing scrubber.

Another new Air Quality Control System (AQCS) technology development is the Clean Energy Recuperator (CER). CER is a heat exchanger located upstream of the dust collection device to remove 99% of the SO3 and to recover flue gas heat to improve plant net efficiency. It also saves about 50% of the water consumption by the FGD.

CARBON CAPTURE AND SEQUESTRATION

Amine-based scrubbing is the CO2 capture technology closest to commercial application. Hitachi has already completed several thousand hours of pilot testing at a coal-fired power plant in Japan and developed an advanced amine-based solvent that has low energy consumption and low solvent loss. We are currently commissioning a 5 MWth mobile pilot plant in Europe that will generate data for large scale demonstrations. In 2010, the Hitachi solvent was pilot-tested and verified by the Energy and Environmental Research Center (EERC), University of North Dakota. Also last year, HPSA, together with our industrial partners, completed Front-end Engineering & Design "FEED" for a 50 MWe CCS demonstration plant.

Oxy-fuel combustion has the advantage of enabling CO2 capture while not affecting the boiler-turbine steam cycle. Extensive in-house studies have shown that the technology can be applied to convert state-of-the-art power plants to oxyfuel combustion. Last year, Hitachi and Vattenfall successfully completed burner and combustion testing at Vattenfall's 30 MWth Oxyfuel

(continued page 16)

RALF SIGRIST

Ralf Sigrist is the President and CEO of Nordex, USA

It's going on three years since Ralf Sigrist landed in Chicago with his family to lead Nordex's newly formed U.S. subsidiary, Nordex USA. At that time, the company consisted of just two employees and a firm plan to build a full-fledged manufacturing operation on American soil that would deliver Nordex products to a booming market.

"Today, we have a new state-of-the-art factory in Jonesboro, Arkansas producing and shipping turbines to three different states and counting," Mr. Sigrist told World-Gen. "We've grown to 180 employees, and our once empty office in Chicago is bursting at the seams. Still, we're not even half way to our hiring goal of 800 people in the coming years, according to market conditions. We are living proof of the often-heard claim that renewable energy creates jobs, thanks to the great potential of wind in America."

"But potential is like an empty glass. It has to be filled," he said and elaborated further on this.

"What do I mean? Let me attempt to cast the question in a new light by way of analogy."

"Suppose that instead of talking about the nation's electrical energy system, we talk about agriculture – food and crops. It isn't much of a stretch, actually, considering that we call a collection of wind turbines a wind farm. And we also say that wind farms harvest wind. We consume electricity at the light switch much like we consume bread and cereal at the refrigerator door – in its finished, packaged form.

"So, let's suppose that America has discovered a new, abundant food source. It grows wild and is completely disease-resistant. It just needs to be harvested and delivered to the market.

"To deliver our old-style farm crops we built roads, highways and railroad – a vast infrastructure. Our new crop also requires an infrastructure – the transmission grid. Unfortunately over the past 50 years we haven't maintained this grid very well or invested much in its expansion. As a result, our new crop might have difficulty moving from the places where it grows in the wild to the cities and population centers that are hungry for our food.

"Let's continue the analogy by supposing that the cost of this new crop is at the moment greater than that of the old-style crop – not by a lot, but by a varying margin nonetheless. There are many reasons for this, including subsidies for the old-style crop that date so far back that no one remembers them, yet they sometimes put our new crop at a price disadvantage. But if we can level the playing field through sound policies that help "retrofit," so to speak, a centuries-old farming market to make room for our new crop, we can be even more cost competitive.

"And suppose that by supporting the growth of this new food source we could replace imports, eliminate health risks and stave off hunger all while creating high quality jobs and growing GDP.

"Naturally, the question that arises is what will happen to our old-style crops if our wild variety really establishes itself in the market. Will they be replaced? Leave barren fields and bankrupt farmers? Certainly not! In part, because there are more and more mouths to feed, and no single food source can feed them all. We will need all food sources well into the foreseeable future.

"Conveniently for my analogy, food security is one of the biggest challenges facing the world right now.

In light of this, I think it's fair to say that the public would support our new crop by helping it get to market and flourish. People would expect government to pave a policy road to make that happen, taking the position that it is in our national interest.

"There is another enormous challenge facing the whole world – energy. We have a free and abundant energy source blowing across the whole country. What will we do with it? Will we as a society help get it to market, believing it is in our national interest?

"My point is that when it comes to food, we all know what to do. With energy, that's not the case."

"In the span of two years, between October 2008 and October 2010, Nordex announced, planned, built, staffed and fired up its 150,000 square foot plant in Arkansas. But in that same two years, Congress debated and ultimately failed to put in place a national energy strategy.

A sound policy framework is still missing. The will to set national energy goals that can secure a new harvest is anemic; the resolve to invest in infrastructure is weak. How will our crop, with all its potential, flourish?

MARKET REALITIES

"Also two years ago, the United States was the largest, fastest-growing wind energy market in the world. That's no longer the case. China now leads. With its rapidly industrializing economy, China knows it will have an energy problem in the future if it does nothing. So, it set a national goal to meet the challenge. The US exchanged its global lead for layoffs, postponed projects and investors with cold feet.

"This happened at a time when, firstly, new jobs were sorely needed and, secondly, everyone knows clean energy can create them. This doesn't make sense.

"Many people have asked me why Nordex didn't experience lay-offs like our competitors here in the United States. The answer is simple – when you have only 10 employees, the threat of mass layoffs fortunately is not a worry.

In other words, our timing was lucky – we had not yet ramped up and so didn't have to ramp down.

"But we are not immune – neither is our plant and neither is our workforce. We make the machines that harvest a new crop of energy, but we can only flourish if the greater market flourishes.

"In Arkansas – our manufacturing home – industrial jobs have declined by 9% over the past two years. That's more than 20,000 manufacturing jobs – a sobering number.

A recent report called Nordex a "bright spot" for the State. There are similar bright spots across the nation, and I strongly believe there are more to come. For example, last year Nordex successfully convinced our steel components supplier – a company by the name of Beckmann Volmer – to build a factory nearby. It will invest $10 million dollars into a plant that will employ up to 500.

"Jobs, industry and wind energy are happening. But it's not a done deal. Now, we have to water what we've planted.

We have to ensure that the industry that has been widely seeded in this country through forward thinking and leadership takes firm root in the national market via strong, sound renewable energy policies at all levels.

STRATEGY AS THE SOLUTION

"What the country badly needs is an energy strategy. I do not mean a tax credit here, a grant there, disconnected from any greater scheme.

Rather, I mean a vision for future energy security. Because what else will the country run on if not electricity?

"From strategy flows policy. Policy is the tool that gets us where we want to go by providing a path and a structure.

And because the energy market is highly regulated at every level imaginable, any new energy source must have a long-term regulatory framework to get traction in the market, as well as to secure financing to build power plants.

Demand for electricity in the US is projected to grow by around 30% by 2030. If we set a goal to provide that growth amount from renewable resources such as wind, solar and geothermal (which we use at our Arkansas plant for heating and cooling), we could create new businesses, lower energy costs and reduce dependence on foreign sources without threatening the jobs and income of conventional suppliers.

"Such a goal, in policy language, is called a "Renewable Electricity Standard," or "RES." Producing 20% of our electricity from renewables is imminently doable if we set the goal and create the policy

"Congress has not managed to do this. Now it's up to the States to act, and many are doing so.

NEED FOR PERSPECTIVE

"One of my favorite American symbols is the bald eagle. The bald eagle has many admirable attributes, but its core strength, I believe, is its perspective. It soars high above the earth and can see the full situation, judging wisely where to go.

"In my view, the reason the nation is stuck in a tar pit when it comes to finally and boldly enacting a true energy strategy is due to lost perspective – the perspective to embrace the opportunity at hand and lay the groundwork for generations to come.

"It is my hope that the precariousness of our current energy landscape will come into sharp relief and perspective will return to policy leaders, together with the broad public, so that the potential of wind can be fulfilled and our energy future secured."

RALF SIGRIST BIO

Ralf Sigrist was appointed President and CEO of Nordex USA, Inc. in 2008. Sigrist has been with Nordex since 2001, first as General Counsel as Head of the Group Legal Department. In this role, Sigrist was charged with building the department and negotiating supplier and customer contracts.

In 2004, he also became Head of Human Resources. His legal expertise and management experience have been an invaluable asset in leading the growth of the Nordex Group over the years, expanding local operations in various countries and the continuous expansion of the supply chain.

Sigrist began his career as in-house counsel in the legal department of Babcock Borsig AG, an international industry conglomerate, during which he supported the Nordex IPO.

He has since worked in the power and wind industries.

Sigrist graduated from the Universities of Tübingen and Munich in Germany with a degree in law and admittance to the German bar, and the University of Aix-en-Provence in France with a Masters in International Law. He is also a graduate of the executive education Advanced Management Program at the Wharton School. Born in Pforzheim, Germany, Sigrist currently resides outside of Chicago, Illinois, where Nordex USA is headquartered. He is married and has two children.

CRAIG ARNOLD

Craig Arnold is General Manager of Dow Oil and Gas

Early on it seemed eco-friendly companies fell into one or two broad categories of environmental commitment: the idealistic greens with bench technology rarely progressing to the pilot phase and the major industrial concerns that went green to comply with EPA or DOE policy and regulations. But that wasn't the case with The Dow Chemical Company, which has been involved for more than 60 years in the capture of from gas streams at refineries and gas plants. Recently Dow developed an Advanced Amine Process (AAP) jointly with Alstom Power that captures from flue gas using its UCARSOL™ FGC-3000 series of solvents.

Dow got involved in clean energy and sustainability because it was good for the planet and made economic sense. But the Dow commitment goes further. "Our corporate objectives include helping customers with energy efficiency and CO^2 management," says Craig Arnold, General Manager of Dow Oil and Gas and a member of *World-Generation's* Class of 2011. "We have a good history of working with energy producers around the world who are equally committed to building efficient energy platforms using AAP technology."

Arnold, who took hold of the reins of Dow Oil and Gas in June, 2010, is spearheading the implementation of its comprehensive strategy not only to capture CO^2 but also to put it to work. "For example, as we hone the technology for capturing CO, we can also use it as a key chemical system in tertiary oil recovery operations," says Arnold, adding that it will enhance the petroleum industry's ability to tap into the billions of barrels of oil reserves – protected by shale and rock – that both the developed and developing economies demand.

Before assuming his current responsibilities at the Dow Oil and Gas in Houston, Arnold served as Global Director of Corporate Development working in Dow Chemical's Midland, Michigan headquarters from 2008 to 2010. Arnold began his career at Dow in 1997, holding various commercial roles in South Africa and Switzerland. In 2004, he was assigned duties as the Global Product Director for Dow's Synthetic Rubber division and took on additional European responsibility for Dow Elastomers in 2006. Arnold was promoted to the role of Global Business Director for Synthetic Rubber in 2007.

BENEFITTING FROM ITS OWN TECHNOLOGY

Dow is a huge consumer of energy, utilizing the equivalent of 850,000 barrels of oil/day – either burning them for energy or using the hydrocarbons as building blocks for chemicals. "As one of the largest energy users and providers of energy solutions and technology," says Ajay Badhwar, Strategic Marketing Manager for Dow Oil and Gas, "no one had or has more at stake in the solution – or more of an ability to have an impact on – the overlapping issues of energy supply, feed stock security and climate protection than Dow."

Since the early 1990s Dow has invested approximately $1 billion in industrial energy efficiency programs for its own operations which has resulted in over $9 billion in savings to the company's bottom line. "Our energy efficiency investments have also prevented more than 90 million metric tons of CO^2 from entering the atmosphere," Badhwar adds.

One such effort getting underway soon in Belchatow, Poland, is a world-scale CO^2 capture facility at Europe's largest lignite-fired power plant. PGE Electrownia Belchatow plant has a total installed capacity of 4450 MW. When capture facility comes on stream as a demonstration plant in 2015, CO emissions leaving the stack from the massive plant will be reduced by 2 million tons per year.

To put into perspective the scope of the carbon capture technology advances expected to be installed at PGE Electrownia Belchatow facility and to give an idea of the enormity of Belchatow power generating capacity, Badhwar offers this outcome for consideration: "Capturing just the slipstream would be the equivalent of removing over 300,000 cars from the road and keeping them off every year."

DOW TEAMS

Dow is working to implement carbon capture technology at Belchatow in a joint development with Alstom Power, a world leader in carbon capture technology, facility design and engineering with ten demonstration projects currently in service in seven countries. The two companies are currently perfecting the AAP technology at a Dow-owned facility in South Charleston, West Virginia. At this pilot plant operation, the partners are not trying to prove the process works, Badhwar points out. It does. Rather, they're narrowing in on the design characteristics that can be applied to the demonstration plants and ultimately adapted for commercial CO^2 scale operations. For the last year and a half, the AAP technology at the plant has captured from a commercial coal-fired boiler at a nominal rate of 1800 metric tons per year.

"We were looking around for a large company to improve our process and improve the chemistry," says Bob Hilton, Alstom's Vice President of Power Technology and Government Affairs. "We approached Dow because we thought it would be a good match." Adds Tim Brown, Director of Communications for Alstom Power: "It was the perfect arrangement – neither party does what the other does."

DOW, ALSTOM, EDF COLLABORATE

In a run up to the project for PGE in Poland, the Dow-Alstom collaboration will launch a project in Le Havre, France in 2012 to further test how the Advanced Amine Process will optimize the process of capturing CO^2 while lowering energy consumption and expanding its flexibility for use within a variety of industrial settings. Dow Chemical and Alstom are working with the French EDF Group to develop, construct, operate and test an industrial demonstration facility to capture CO^2 at the coal-fired electric power plant in Le Havre, France. Engineers and chemists hope to demonstrate the operability and efficiency of post-combustion CO^2 capture using the Advanced Amine Process jointly developed by Alstom and Dow.

The AAP technologies to be tested at Le Havre have been specifically developed to capture the CO^2 emitted by burning coal, oil or gas. The demonstration facility will help to verify the optimized performance of this advanced technology, particularly with regards to energy consumption and flexibility in use within an industrial setting.

The project is partly funded by the French governmental body ADEME – The French Environment and Energy Management Agency. The project program includes execution, testing, evaluation and validation phases of the CO^2 capture unit at the production site. The industrial demonstration facility of Le Havre represents an essential step for Alstom and Dow in the development of competitive solution for the capture and storage of CO^2.

From Dow's perspective the joint development has also been mutually satisfying and beneficial not only to both firms but to the planet as well. "It is a unique collaboration," says Arnold, "with two strong companies using their expertise to confront the challenges of CO^2 from coal-fired operations." With global CO^2 emissions expected to increase 70 percent by 2050 as energy demands spike in developing economies – not to mention concerns about climate change – action needs to be taken. For its part, Dow invests $1.6 billion in research and development each year –more than the combined R&D budgets of the chemistry programs of all American universities – focusing on these and other global challenges.

For its part, Alstom also touts a strong commitment to the environment while promoting technical practicality and good economic sense. All of the technology Alstom develops, Hilton explains, is designed to be 'retrofitable' for most of the existing coal-fired plants and facilities around the world.

Through their collaboration, Dow and Alstom developed several new aspects of efficiently capturing CO^2 from flue gas operations. As they studied several solvent characteristics of the AAP at the South Charleston plant, they attained a 90 percent capture rate despite variable CO^2 inlet concentrations, and maintained consistent operation in terms of energy consumption and water neutrality. The Dow-Alstom team also fine-tuned automated control systems and improved control strategies for regenerator condenser temperature, condenser reflux levels and column sump levels.

NEW USES FOR CO^2

Dow and Alstom are also committed to improving existing solvents and developing new ones – such as the UCARSOL™ FGC-3000 Series of solvents designed for flue gas capture, which according to Dow's Badhwar, has demonstrated energy requirements as a low 2.8 GJ/ton CO^2 with a conventional flow scheme. There are so many advantages to using chemistry smartly. "We also want to convert energy and hydrocarbon materials to higher value products and feedstock," explains Arnold.

Some of those products include run-of-the-mill plastic items and merchandise, as well as composites and new polymer structures for high tech equipment and components. Several areas in which Dow is hoping to expand the use of captured CO^2 are in renewable energy development.

There's a poetry – or at least a symmetry – to the synergy involved in taking greenhouse gas particulates and pollutants from flue gas and turning them into processes, materials and equipment that generate clean, sustainable energy. "For example, captured CO^2 could be converted into materials used in the manufacture of the wind turbine blades that are already producing renewable wind power," says Badhwar. He notes that CO^2 streams have been used in the processing of algae ethanol which can then be converted to fuels or plastics.

Other Dow efforts focus on reducing the amount of energy consumed, such as the composites found in energy-saving residential roofing, siding and insulation materials.

Fossil fuels still remain the cheapest, most efficient source of energy available. Any technology that allows both easier access to fossil fuels and their cleaner combustion and use is an important bonus for industry and the planet. Craig Arnold and his team at Dow Oil and Gas are committed to managing CO^2 emissions – slowing, stopping and reversing them – and then recycling them as materials and building blocks for a cleaner, sustainable environment.

MICHAEL HOWARD

Michael Howard is the President and CEO of Electric Power Research Institute

Global electrification is one of the 20th Century's most important innovations that shaped the economic and social progress of the developed world. Even a cursory review of the last century shows the tremendous value electricity has provided, including lighting our homes and factories, pervasive use of electric-driven labor-saving appliances, global communications and electronic commerce – the list seems endless. Electrification is so ubiquitous that it has become an almost unnoticed part of our lives while quietly powering our largest buildings and machines and our smallest personal handheld devices.

But today's power system that enabled yesterday's global electrification must now be transformed to provide a cleaner, modernized generation fleet with a more interactive electric grid to meet tomorrow's increasing demands. The technical innovations required to meet these demands, while keeping electric service reliable and affordable, present us with daunting but achievable challenges.

Analyses at the Electric Power Research Institute (EPRI) have found that there is no silver bullet among the various power generation and delivery technologies; all must be developed and deployed to achieve a cleaner generation mix and interactive electric grid. We must use lower-emitting generation technologies, including renewable energy and nuclear and coal and natural gas with carbon-capture and storage, and transition to a power system that is more interactive with consumers. But we also must recognize that we will not and cannot instantaneously move away from fossil fuels. Coal will continue to play a very important role in our generation mix, and we need to press forward on technologies that will allow us to continue using coal as a fuel but do it in a way that will minimize its environmental impact. This challenge requires a robust and durable technology strategy that minimizes costs to the economy; is technically feasible and achievable within lead times needed to develop advanced technologies; flexible in the face of possible technical setbacks; and results in technology deployment in time to affect a long-term sustainable environment.

We must also work throughout the entire electricity. Efficiency gains have long been recognized as among the most effective ways to reduce emissions and other environmental impacts but the technological challenges are both diverse and steep.

In order to provide society with reliable, affordable and sustainable electricity, we must navigate competing constraints. Doing so requires an economically sound pathway with reasonable deadlines that can be achieved with commercially available and demonstrated technologies. In addition, solutions must take into account various regional issues and constraints on utilities and also reflect applicable cost-benefit principles to minimize impacts on customers, the economy and jobs. Electric utilities need a regulatory framework and technology portfolio that enables them to meet their customers' needs on a cost-effective basis.

The preeminent challenge facing the electricity sector is to produce power in a cleaner, near-zero emission generation fleet, and deliver it over an interactive electric grid. The current system was not designed to serve a restructured electricity marketplace, the demands of a digital society, load from electric-drive transportation, the integration of distributed and renewable generation, energy storage, two-way interface between customers and their equipment with various sensors, controls or cyber security requirements.

The power system must evolve into one that monitors, protects and automatically optimizes the operation of inter-connected elements. This will include both central and distributed generation, high-voltage transmission, and the distribution system, which will interact with such new components as energy storage installations, distributed generation resources and a growing variety of "smart" and interactive devices, in industry, business and residential markets.

As we consider the immediate challenges to the electricity sector– those in the 15- to 20-year timeframe – it is clear that technical innovation must begin now in order to make meaningful impacts in improving environmental sustainability while at the same time providing reliable and affordable electricity.

EPRI's research shows that over the coming decades, it is technically feasible for the electric sector to transform to a cleaner generation mix while meeting the ever-increasing demand for reliable and affordable electricity. However, the challenges to achieving this objective are daunting in both their scope and complexity.

Following are seven major focus areas for this work:

- Improve the electrical efficiency of the entire value chain – from generation to end-use. On the generation side this means increasing efficiency and heat rates, so that less fuel is required to produce the same amount of electricity. On the end-use side, it requires developing technologies such as LED lighting that is more efficient in converting electricity to light our homes, and more efficient power supplies to power the billions of consumer electronics that have proliferated over the past decade and will continue to do so in the future.
- Deploy cost-effective, large-scale renewable energy resources, and address challenges to safe, reliable grid operations associated with balancing demand with variable-output electricity sources.
- Ensure that power delivery and quality are reliable and responsive to the standards and demands of our computer-dependent, microprocessor-driven economy.
- Continue the safe, reliable and efficient operation of our existing generation, transmission and distribution assets including our nuclear fleet with a goal of extending nuclear plant operating licenses out to at least 80 years while adding new nuclear generation.
- Manage an economic transition to a lower-emission fossil generation fleet, including the use of carbon capture and storage for coal and natural gas generation.
- Build a smarter grid to achieve a dynamic balancing of widely diverse supply-side and demand-side resources. This will enable energy efficiency, renewable energy, energy storage, electric transportation and new end-use electro-technologies.
- Manage water strategically. The electric sector faces an increasingly water- constrained future, posing several challenges related to minimizing freshwater entering the plant, maximizing efficient water use in the plant, and effectively managing plant discharges.

In 1965 Gordon Moore, the former chairman and president of Intel, observed that, over the long term, the number of transistors that could be placed inexpensively on an integrated circuit doubled every two years. Over the years, "Moore's Law" became a self-fulfilling prophecy that continues to drive relentless innovation. We have experienced an equivalent to Moore's law in the United States electricity sector.

As we embrace the challenge of providing reliable, affordable and sustainable electricity, technical innovation must and will continue to provide the key to success that it has for over 100 years. For example, the real price of electricity in the United States today is about the same as it was 40 years ago. And, we have achieved this feat while substantially reducing the environmental impacts of electricity generation. Sustaining constant real electricity prices should be one of the driving forces for relentless innovation across the entire portfolio of low-emission electricity technologies and a more interactive electric grid.

This tremendous accomplishment by all stakeholders in the electricity sector has been due to continuous technology innovation that resulted in providing society with reliable and affordable electricity – a very important driver of economic growth and prosperity. It must also be one of the yardsticks by which we measure the validity of technologies and breakthroughs in the century ahead. Electricity consumers individually and the markets collectively are unlikely to reward any technological breakthrough if the cost undermines their ability to buy and use electricity.

Our job is to continue developing innovative technical and economic solutions to improve the reliability and affordability of the generation, delivery and use of electricity. As we look forward, technological innovation will be critical to the development of solutions that will ensure a full portfolio of responsible electricity options. Our job is to innovate and to think big while we're doing it. Think big for each technology. How far can we push it? What new levels of reliability and efficiency can we imagine? How can we apply the innovations from other economic sectors – from computers, from automobiles, from housing and basic manufacturing?

Our scientists, engineers and researchers at EPRI look at the big picture – such as how a nationwide grid can become more effectively interconnected and protected against disasters either natural or manmade. They also look at the microscopic details of materials, to determine how they are aging and how they can be replaced or maintained for long-term operations of our infrastructure.

As each technology and operational breakthrough moves from idea to research, development, demonstration, early deployment, and, eventually, wide-scale deployment, it must be continually subjected to rigorous, objective engineering and economic analysis to assess its benefits and its costs.

At the heart of it all we remember that billions of people still do not have access to reliable electricity and are hungry for, and working toward, acquiring electricity in their everyday lives. When it is available to them, they will realize the same health, prosperity and comfort that is enjoyed in the developed world. Electricity is the greatest tool for human progress we've ever built. Now is the time to make the greatest even greater.

MICHAEL W. HOWARD BIO

Dr. Michael W. Howard is the President and CEO at the Electric Power Research Institute (EPRI).

Howard has over 30 years of results-driven, multi-faceted leadership experience in organizations ranging from entrepreneurial start-ups to large public companies with increasing responsibilities in operations, finance, sales and marketing, product development, and strategic planning. Most of his experience is in providing technical consulting services and products to both U.S. and international electric utility companies.

Prior to his current appointment, Dr. Howard served as Senior Vice President, Research and Development, and President and Chief Executive Officer of EPRI Solutions, Inc., a wholly-owned subsidiary of EPRI. EPRI Solutions was created by the merger of three companies, one of which was the EPRI Power Electronics Application Center (PEAC) Corporation where he served as President and Chief Executive Officer.

ERIC HAFTER

Eric Hafter is the Senior Vice President of Sharp Solar Energy Solutions Group

Sharp Solar Energy Solutions Group is the sales and marketing arm of Sharp's North and South America solar operation. Sharp Corporation, based in Osaka, Japan, was founded in 1912 by Tokuji Hayakawa as Hayakawa Metal Works. It adopted its current name in 1969. The company began mass producing solar cells and selling them commercially in 1963, and entered the US solar market in 2002 when SESG was established. Sharp Manufacturing Company of America had already been established in 1978 to produce color TVs. It began assembling solar modules in Memphis, Tennessee in 2003, and the two-millionth solar module rolled off the Memphis production line in the summer of 2010.

Among its many installations, Sharp solar systems are now operating or in construction on Google's headquarters in Mountain View, California (1.6 MW), Denver International Airport (2 MW, plus a second 1.6 MW system), City of Brea (1.8 MW). the American Drive Business Center in Jackson, Tennessee (1 MW) and at two solar parks in Norfolk County, Ontario, Canada (18.5 MW).

Eric Hafter moved to Sharp as head of SESG in August 2010 where he is responsible for all sales and marketing of the company's solar products. He came from Solar Power Inc. where he was Chief Strategy Officer. For over 10 years he served at PowerLight Corporation before it was acquired by SunPower, and served on PowerLight's Board of Directors, then joined the company to lead its successful entry into Europe as general manager of PowerLight Europe.

Hafter said the market outlook for North America is tremendous in terms of volume. The US market in 2010 almost doubled to 2.2 GW, and experienced a 100% year-on-year growth rate. Sharp's share of the market in 2009, according to Solarbuzz, a solar market research and analysis firm, is 15%, according to Hafter who could not reveal internal company statistics.

Sharp has two production plants in Japan, one in England, one in Italy and another plant in Memphis, Tennessee where it employs more than 450 union members and produces 160 MW of solar modules annually.

Hafter said the first challenge for Sharp in the US is the very low cost products flooding the market from China and south of the border. "This is the challenge for our company which takes labor relations seriously."

The perception is that solar is over-subsidized in the US, Hafter said, referring to the investment tax credit. But fossil fuel subsidies heavily outweigh those in solar, he explained.. "Our costs are declining so fast, we hope we won't need subsidies by the time the tax credits end in 2016." He expects the company will have passed through the grid parity point in many states by that time.

The second challenge is the need for continued long term political support, both at the state and federal level, Hafter said. "As we move into the next political cycle, we have the challenge of facing global warming deniers having substantial power. Looking out over the competition, our biggest competitor is dirty energy. The real challenge is developing the political will in the US to move past the carbon economy. We have to have the political will to push for renewable energy solutions."

SHARP IS A LION

Hafter said the economics of solar are overwhelmingly positive. He cited an example of a retired couple who calculated they would spend $92,000 in electric bills in their remaining years. A solar system will cost them $22,000, after incentives, allowing them to not worry about those electric bills. Hafter believes solar is a durable good, and should be financed as a home is.

Hafter is bullish on Sharp's expanding position in the market place. "It's without a doubt that the Chinese model of incredibly low labor costs, huge subsidies and getting free land means they are able to claim low

(continued page 14)

CLASS OF 2011

JERRY GRUNDTNER

Jerry Grundtner is Vice President of Project Development at Mortenson Construction

Jerry Grundtner is vice president of project development for Mortenson Construction's Renewable Energy Groups. As a 23-year Mortenson veteran, Grundtner is responsible for providing overall strategic direction for the Renewable Energy Groups' project and business development activities in the wind power market. His vision brought Mortenson into the wind industry in the mid 1990's, and he has since overseen its unprecedented growth into a leading North American renewable contractor. He has been a board member of the American Wind Energy Association for the last four years and a member of the American Wind Energy Association Legislative committee for three years.

Grundtner's diverse wind project experience includes Farmer's City Wind Farm in Tarkio, Missouri; Carroll Wind Farm Expansion in Carroll, Iowa; Mount Storm Wind Project, in Mount Storm Washington; Sherbino Mesa Wind Project in Fort Stockton, Texas; and Cedar Creek Wind Farm in Grover, Colorado, among others.

As one of the first contractors to enter the wind market Mortenson constructed its first wind project in Adair, Iowa in 1995 and has since led the industry in wind energy construction throughout the United States. In 2005 Mortenson entered the Canadian marketplace to better serve the needs of its customers and recently opened an office in Toronto. Today, Mortenson is one of the largest renewable contractors in Canada.

In addition to wind power, Mortenson's Renewable Energy Groups construct facilities that generate solar power, biofuels and hydro-electric power. Mortenson also provides services to a broad range of industries including, education, healthcare, manufacturing, mission critical and sports facilities.

WORLD-GEN: WHAT ARE THE MAJOR ISSUES FACING THE WIND ENERGY INDUSTRY TODAY?

Jerry Grundtner: The lack of strong Federal Renewable Energy Standards continues to plague the wind industry. Without strong federal standards, wind owners and developers have no clear assurance that there will be a viable and growing market for wind energy in the future.

Difficulty in negotiating viable wind energy power purchase agreements (PPA) agreements is also a significant challenge. The current economy and abundance of cheap energy— such as natural gas— has created an unfavorable pricing environment that makes the successful negotiation of power purchase agreements difficult. Therefore, it is very challenging to secure the long-term revenue streams needed to fund new investments and have a profitable return on investment.

Undeveloped transmission infrastructure is another major issue. Without robust regional planning and effective transmission policies, there will continue to be areas with strong wind resources that are unable to deliver clean energy to the load centers. This issue needs to be urgently addressed so that the transmission investments required to support new generation projects can occur.

WORLD-GEN: HOW IS MORTENSON HANDLING THE CHALLENGES OF EXECUTING NEW PROJECTS?

Jerry Grundtner: There are numerous challenges with the execution of wind projects today.The permitting process continues to become more challenging and time-sensitive as to when permits are needed to start construction. Many municipalities are requiring more permits and are charging higher costs to secure them. Schedules are also becoming more compressed. In the past, contractors had at least seven to eight months to construct an average100 megawatt project. However, in today's market, many of these projects are expected to be completed in five to six months.

Additionally, the competitive pricing for the construction of a wind project is requiring significant accuracy in the initial cost estimate, which has recently become more of a challenge with commodity price increases. Customers are demanding accurate estimates that they can rely on to finalize and secure their financing.

To meet many of the growing challenges and demands— even through the recent recession.

Mortenson has continued to hire highly experienced team members to maintain a heightened focus on meeting customer's needs. For example, the Renewable Energy Groups employ a team of seasoned estimating professionals who are solely dedicated to preparing accurate project estimates to ensure cost certainty. Our integrated approach to preconstruction services incorporates lean practices into every activity. By eliminating inefficiencies in engineering, planning, and construction processes, we can ensure our projects are delivered on time and on budget.

In 2010 Mortenson hired 62 new team members that are exclusively engaged in the renewable energy markets that Mortenson serves.

WORLD-GEN: HOW IS WIND IMPACTED BY OTHER ENERGY SOURCES?

Jerry Grundtner: There have been significant investments in natural gas as new extraction technologies have been proven to be effective. While natural gas may diminish the growth and interest in renewables to a certain extent, the renewables industry should continue to grow and develop over time.

Nuclear energy is believed to have the greatest long-term potential of surpassing wind energy in terms of annual capacity additions. The U. S. government has shown a recent willingness to support nuclear energy in the face of foreign energy dependence and global warming concerns. New legislative initiatives such as the Nuclear Energy Research and Development Act of 2010 authorize the Department of Energy to fund a wide variety of new advanced research programs for nuclear energy.

Solar energy is not generally viewed as posing a threat to overtake wind energy. Solar will be a renewable energy source that will continue to grow in installed megawatts; however, the price per installed megawatt of a solar energy system is likely to remain higher than wind.

WORLD-GEN: PLEASE SHARE MORTENSON'S SOLAR PROJECT EXPERIENCES.

Jerry Grundtner: Leveraging our leadership position in the wind energy space, Mortenson began pursuing utility-scale solar projects in 2008. To date we have completed five solar projects using Photovoltaic (PV), Concentrated Photovoltaic (CPVC) and Concentrated Solar Power (CSP). We've also been selected to complete several new solar projects in 2011 and recently began construction on the largest CPV solar plant in the world.

WORLD-GEN: IN WORLD-GEN'S 20TH ANNIVERSARY ISSUE IN 2008, RANDY SWISHER OF AWEA PREDICTED THAT 46 STATES WOULD DEVELOP WIND POWER. HOW MANY WIND POWER PROJECTS HAS MORTENSON CONSTRUCTED IN THE US AND CANADA?

Jerry Grundtner: Over the past 16 years, Mortenson has emerged as one of the leading renewable contractors in North America. Between the United States and Canada, Mortenson has built nearly 100 utility-scale wind projects ranging in size from 10 megawatts to 450 megawatts that generate a total of 10,000 megawatts of clean energy across 29 states and four provinces. Mortenson has installed all types of utility-scale turbines and have worked in partnership with new and existing manufacturers to help develop new prototypes that are significantly larger and installed on taller towers.

WORLD-GEN: WHICH STATES OFFER THE BEST OPPORTUNITY FOR WIND DEVELOPMENT IN THE FUTURE?

Jerry Grundtner: Texas continues to be the leading provider of wind power with over 10,000 megawatts of installed capacity out of a total of 40, 243 megawatts installed across 38 states nationwide.

Texas' favorable business environment for wind energy is primarily due to its passing of a renewable electricity standard, which has helped to create approximately 10,000 jobs in the wind industry in the areas of manufacturing, construction, maintenance, corporate/headquarters and support positions. Following Texas, Iowa, Minnesota, California and Washington are most actively engaged in pursuing renewable energy projects and represent the states most likely to show wind energy growth in 2011.

While the U.S. wind industry declined by nearly 50% in 2010 from the previous year, the last quarter of 2010 was strong and we expect to see continued growth in 2011. We also expect to see strong growth

ERIC HAFTER

CONTINUED FROM PAGE 13

costs. It's a natural part of our [economic] system" he said. "As products become more of a commodity what Sharp is doing is increasing the value of our products by expanding what we do in the marketplace and leveraging our strengths as a company."

"Sharp has a venerated name that people trust and we are totally bankable," Hafter said. As a result, "There's not a bank in the world that doesn't love to see Sharp as part of a solar project." At the core, as solar products are being developed they have to be bankable – a huge barrier. As lenders put money into a project, they have to feel comfortable that the technology is good and the warranty is reliable, he explained.

Sharp has been around longer than its standard 25-year warranty. "It's hard to overstate the importance of this," Hafter said. When a bank evaluates a project for financing, it wants to know the likelihood of the competition being around in 20 years, he explained. Since Sharp Solar has been around longer than a 25-year warranty, "it's hard to overstate it's impact, he said.

Sharp is evolving, Hafter said. SESG will be announcing new products and services soon that will add value to its panels and to remain at the front end of technology. He couldn't offer details yet, but said to look for an announcement at the beginning of summer.

Sharp is looking at expanding the company's business model by moving to system solutions where it can add value to the overall solar system including financing, how to work with utilities, to contracting and helping developer clients be very successful. "We don't want to compete with customers, in contrast to other companies," he explained. "Our intent is to offer support."

In initiating its financing business, SESG announced in December it had hired Isobal Allen as Director of Strategy and Finance.

TOM HECHT

Tom Hecht is the President and Chief Sales Officer for Schott Solar PV, Inc.

For most Americans, energy is a mystery. When we flip on a light switch or turn on our computers, we generally don't know, or think about, where that power is coming from. All we know for sure is that when we insert a plug into a socket, we should get electricity.

But what if Americans actually did think about their energy sources? Though they might be unclear on the mechanics of how electricity gets from a coal plant or solar array to their living room, might Americans actually have a preference for one type of energy source over another? If they did, which ones would they vote to support if they were making the decisions in Washington, DC?

Three years ago, SCHOTT Solar decided it was time to end the mystery. We were curious to know what Americans' opinions were on the energy source they use to power their lives every day. Specifically, we wanted to know what the American public thought about solar energy.

Solar is a clean energy source that's been very popular with SCHOTT for a long time. In fact, we've been developing and manufacturing components for the solar industry since 1958. We figured many Americans supported solar energy. But being scientists and engineers, we wanted to know the facts.

TEAMS WITH SEIA

That's why we teamed up with the Solar Energy Industries Association (SEIA) in 2008 to commission independent polling firm Kelton Research to survey 1,000 nationally representative Americans ages 18 and over. We believed that solar would be a popular energy source, but we were pleasantly surprised by the results.

The first SCHOTT Solar Barometer™ was released in June 2008 and found that 94 percent of the American public believed it was important for the nation to develop and use solar energy. These results came at a time when the 2008 presidential campaign was heating up and partisan politics were in full swing. But solar energy was one issue that received overwhelming support across the political spectrum. Among independent voters, 98 percent supported development and funding for solar; 97 percent of Democrats and 91 percent of Republicans agreed.

Congressional leaders took notice of this support for solar and extended the solar investment tax credit for eight years, one of the most crucial policies for adopting more solar energy. Solar's strong public support lasted into 2009 when our survey found that 92 percent of Americans supported developing and using solar.

As a company that values high quality backed by research, we commissioned a third Solar Barometer in 2010 to validate that supporting strong solar policies was more than just a passing phenomenon.

2010 SOLAR BAROMETER

We released the 2010 SCHOTT Solar Barometer in October 2010 on the eve of Solar Power International, North America's largest solar energy trade show. For a third consecutive year, our poll showed that more than nine out of ten Americans (94 percent) wanted more solar, now.

The SCHOTT Solar Barometer highlights Americans' wide and growing support for clean, reliable solar energy. However, solar remains just a small portion of our country's energy portfolio. According the U.S. Energy Information Administration, solar accounted for just one percent of U.S. energy consumption in 2009.

With a combination of very high public support and abundant solar resources, we wonder why solar does not play a more significant role in America's energy portfolio. Much of that growth depends on energy policies.

Germany, with solar resources equivalent to Alaska, is the world leader in installed solar capacity. That growth was driven by cohesive national energy policy.

In the U.S., much of solar's growth has been driven by policy at the state level. Despite the abundant solar resources in the U.S. Southwest, a Mid-Atlantic state, New Jersey, ranks second (behind California) in installed solar capacity in the United States because of its smart solar policies. This underscores the important need for policy, not solar insolation, to drive the market.

National public support is now being reflected in the actions of leaders in Washington. In his State of the Union address, President Barack Obama reflected the growing public support for policies that will develop and promote use of solar and other renewable energy sources. A major part of that plan is to address federal subsidies to fossil fuel industries.

For reference, the Environmental Law Institute reported that from 2002 to 2008, well-established fossil fuel industries received $72 billion in federal subsidies. During that same period, the relatively young and developing renewable industries received $29 billion. Almost half of those renewable subsidies went to the corn-based ethanol industry. The fast-growing solar industry received less than $2 billion.

When President Obama called for an end to subsidies for the oil industry, he expressed the opinion of four out of five Americans. Our poll found that 80 percent of Americans agree that Congress should consider reallocating federal subsidies that currently support fossil fuels to instead support solar. One-third of those polled strongly agreed.

We also asked which energy source Americans would support if they were President of the United States. Nearly half (45 percent) would choose solar power as an energy source to provide financial support. No other energy source received more than 20 percent support. As the President and Congress publicize their budget proposals in the coming weeks, we will be interested to see whether these proposals will express the same level of support.

That decision comports with other Americans that are considering solar power options for their home or business. Of that group, nearly half plan to make a decision to adopt solar power in less than one year. Those solar supporters should be buoyed by last year's announcement that the Obamas are planning to install photovoltaic (PV) solar panels and a solar thermal system at the White House residence in the near future.

SCHOTT IN NEW MEXICO

More people deciding to go solar equals more American jobs. According to The Solar Foundation's 2010 National Solar Jobs Census, nearly 100,000 Americans were working in the U.S. solar industry as of August 2010. "The fact that a national census is needed to examine the size and nature of the workforce signals that the solar industry is having a substantial and positive impact on the U.S. economy," according to Andrea Luecke, acting executive director of The Solar Foundation.

More than 300 of those workers are employed at SCHOTT Solar's flagship manufacturing facility in Albuquerque, NM. SCHOTT and other solar manufacturers are helping to create jobs not just in factories, but along the entire value chain.

In all 50 states, the solar industry is employing people manufacturing the latest solar technologies, installing solar panels on homes and businesses, constructing utility-scale solar plants, and in offices offering support in finance, legal, sales and marketing departments.

"Among other things, this study shows that investments made through Recovery Act—including the $2.3 billion in tax credits to U.S. based clean energy manufacturing—are already generating positive results," said Secretary of Labor Hilda L. Solis upon release of the National Solar Jobs Census. "The solar energy sector is an increasingly important source of good jobs for Americans. Fostering the growth of this emerging industry will help protect our environment, ensure the U.S. remains competitive in the global economy, and offer great opportunities for the nation's working families."

THE FUTURE OF SOLAR

The future of solar employment looks strong. According to the National Solar Jobs Census, solar employers expect to hire 26 percent more employees between August 2010 and August 2011.

This is good news for the Americans we surveyed about starting a job in a renewable energy industry. More than half (51 percent) would choose to work in the solar industry over other renewable energy industries.

The wide and growing support of Americans for solar energy validates the work performed by solar industry pioneers between the time President Jimmy Carter's solar panels were removed from the White House in the early 1980s until the first solar investment tax credit was enacted in 2005. Even with little federal support, solar companies like SCHOTT were still able to innovate and drive down costs.

But solar industry leaders are not satisfied with validation. Since 2005, technology advances have accelerated. These innovations, combined with new financing methods, are driving prices down and solar adoption up. Yet still, only 1 out of 100 Americans gets power from solar while 94 out of 100 Americans want solar.

"It is time for policymakers to listen to their constituents and enact measures to rapidly increase our use of solar," said Rhone Resch, president and CEO of the Solar Energy Industries Association. "As we debate many crucial social and economic issues during this Congress, lawmakers should consider solar, not as an issue, but as an industry they can count on to create jobs, improve U.S. competitiveness and bolster our national security. It's time for Congress to see what most Americans already see; that solar is working for America today."

The SCHOTT Solar Barometer tells us that Americans do want to know that when they flip on the light switch, they are getting clean electricity from a solar panel on their roof or from a utility-scale solar installation connected to the electrical grid. Now it's time for policy to follow that lead.

TOM HECHT BIO

Tom Hecht was appointed President of SCHOTT Solar PV, Inc. in October of 2010, after having joined SCHOTT Solar as Executive VP of Sales and Marketing in 2009. In this position, he is responsible for the overall strategic direction and sustained sales and market growth of the company.

He was previously Director of Business Development and Marketing at Miasolé, a CIGS thin-film PV module manufacturer. Prior to that, he held management positions in Corporate Development and Marketing in the telecommunications industry.

Hecht is a founding member of SolarTech, a Silicon Valley-based PV organization. He holds an MBA from the Wharton School, and is a graduate of the University of California, Berkeley. He lives in San Jose with his family.

CLASS OF 2011

BOB BIBB

Bob Bibb is the President of Bibb-EAC

If you pressed him about his career, Bob Bibb might admit he'd rather have seen his classic rock and roll group Mach 4 record a Platinum hit or have one of the cinema productions he was involved in win an Oscar. Instead, in 1979 he founded and developed Bibb and Associates, an engineering, design and construction company which is one of only about 15 firms in the country specializing in the design and construction of power plants and related facilities. Since the early 1980s, the power industry has considered Bibb a leader in the field of fluidized-bed boiler projects.

Actually Bibb has gone down the start-up path twice in the 41 years since he graduated from the University of Kansas with a B.S. in aerospace engineering. The second time around occurred seven years ago when he decided to "reconstitute" Bibb and Associates – which he sold to Kiewit in 1998 – as Bibb Engineers, Architects & Constructors (Bibb-EAC) in Kansas City, Missouri, where he is Chairman/CEO. "We started all over in early 2004 with no clients, no employees and no office," he says, after his five year non-compete agreement with Kiewit expired. He had sold the assets of his original firm to Kiewit but not the stock or the corporation. Kiewit is the fourth largest construction contractor in the U.S. and one of the largest in the power generation industry.

Bibb, though, was chafing at the bit. While he maintains a high regard for the company who bought his business, Bibb realized he "was failing at golf" even after five years of trying and, more importantly, he missed the power business he loved and the work he knew how to do.

It's not easy to walk away from a career in which you worked on over 1,500 individual assignments for more than 500 clients – just when you're in your prime.

"Don't get me wrong," he explains, "I am into music, enjoy riding my Harley, have shopped some script ideas around Hollywood and have tried to produce some films, but that's not my life's work" – although there is no denying these interests are a big part of it. Bibb owns a recording studio in Kansas City run by a Grammy Award winning engineer with over 50 Platinum and Gold Record hits to his credit. He still plays the guitar he's owned since he was 16 with his band at local bars and private gigs, and has also driven his Harley to seven of the annual bike rallies at Sturgis. Classic movie posters, instead of photos of power generating stations and construction projects, adorn the walls of the current offices of Bibb Engineers, Architects and Constructors. And the carpeting is in theme with a renovation project the company completed for two Las Vegas casinos.

Nevertheless, Bibb's company footprint in the power engineering field is Bob Lanier-sized compared to the tracks he laid down in show business. At one point, as the saying goes, the sun virtually never set on the projects Bibb and Associates had worked on in the 20 years before Kiewit acquired it. The firm was involved in projects in more than a half dozen countries and 40 states at home.

"These international projects included three with Japan's Marubeni, one of the world's largest companies," says Lou Gonzales, Bibb President, "including a 220MW combined cycle project in Cali, Colombia and two different 170 MW GE 7FA gas turbines in Mexico."

Both the original Bibb and Associates and the current Bibb-EAC have had a hand in just about every type of power generation facilities development except for nuclear and hydroelectric. According to Gonzales, only about 15 of Engineering News Record's Top 500 engineering firms are seriously involved in power plant design and they tend to be the largest companies. "Of those 15, four of them plus us, are located here in Kansas City," Bibb adds.

Over the last seven years Bibb-EAC has been active in a variety of projects ranging from repowering existing plants to renewable energy, Gonzales explains. "We have just completed a detailed design and start up on a 330 MW combined cycle repowering project, as well as a detailed design for a 'Power Tower' concentrating solar thermal power plant that Power Engineering magazine named its 2009 Renewable Project of the Year." The firm also counts among its recent projects a 300 MW coal handling system and a 300 MW air-cooled condenser vacuum system and electric boiler.

GETTING DOWN TO BUSINESS

Most of these top power engineering companies that Bibb-EAC is in league with are giant operations engaged in billion dollar projects. Bibb and his engineers, however, offer specialized services to the $50 to $500 million projects with 50 MW biomass to 500 MW combined cycle range capacities. The company has taken a foothold in renewable energy technologies including solar thermal and PV projects and working on biomass, wood-fired and landfill gas power generation.

"We are not known that well by the utilities," Bibb points out, "but we are a household name in the IPP sector, and highly respected. Our work with traditional utilities is growing."

In fact, the emergence of the independent power producers industry in the late 1970s on the heels of the oil embargoes earlier in the decade helped put Bibb in business for himself. "About the time I had made a personal commitment to start the company and was working out of a spare room in the house, Congress enacted PURPA," he says.

The Public Utility Regulatory Policies Act mandated the monopolistic electric utilities to purchase power from more efficient producers if their costs were less than that of the utilities. One of the significant offshoots of PURPA was the demand for cogeneration plants. "Passage of PURPA concurrent with the start up of Bibb and Associates was fortuitous for us," notes Bibb.

His company literally grew up with the IPP industry, working on IPP projects up to 1,100 MWs with developers, banks, OEMs and EPC contractors. "Some of the owners," Gonzales lists, "include Edison Mission Energy, AES, NRG, Air Products & Chemicals, LS Power, Indeck Energy, Anheuser-Busch, Merck, DuPont, GM, Kodak and Kansas City Power & Light."

Bibb emphasizes he has been lucky to work in the power industry. "In the 41 years I've been in the industry – with my own company for 31 years of that time," Bibb recounts, "I have lived through embargoes, technology development and an increasingly regulated business environment. I would consider myself one of the relatively few who have been active this long in the IPP field."

Bibb sees that as somewhat of a benefit, explaining that he doesn't necessarily have to craft a long-term management view based on a short-term strategy that can shackle public companies. But he still sites an abundance of challenges for the industry: "Partly because every five years there is a huge change whether it has to do with technology, energy and environmental policy, fuel prices, natural resource supply, demand and so on."

Although he doesn't like using the shopworn term paradigm shift, Bibb sees something coming and knows the global and domestic economies will not improve if business is conducted as usual. That goes for the power generation business, too. "There is a fundamental shift in how the electricity industry will be managed," he predicts. He supports his hunch by citing the industry will encounter additional environmental pressures and regulation – in response to global warming concerns – and see construction of larger experimental renewable energy facilities. But economics and policy could be shaken by the realization that abundant supplies of inexpensive natural gas may come on stream from shale recovery operations and be available for the next 30 years. Additionally, he says, the reality of the nuclear power situation is that it won't develop quickly, and safety issues may reemerge to dampen development. "The next wave of power plants will need gas," Bibb maintains. He believes clean coal will also remain in the new capacity mix.

"Another less obvious but very significant issue and challenge for the power engineering profession is how we address the load duration curve," Bibb says. "Right now plants are built to produce energy to meet the maximum demand annually for one hour." The power industry needs to advance the complex technology of designing power plants to efficiently produce more energy at 'System Peak MW' demand or reduce system peak. "But that will be extremely expensive," warns Bibb, "and I anticipate it will take many years to implement a reliable system." This will involve a host of factors including Smart Meters, Demand Side Management, electric cars and so on – and perhaps time-of-day rates.

But that is just the type of devil-in-the-details challenge veteran engineers love to take on, and one that strikes a chord with Bibb. He and his team intend to apply both sides of their brains – the empirical and creative – to come up with solutions for the industry.

DR. SONG WU

CONTINUED FROM PAGE 9

Plant. We are actively pursuing demonstration activities in North America and Europe with the target to have both CO2 scrubbing and oxyfuel combustion technologies commercially available by 2020.

NEXT GENERATION ULTRASUPERCRITICAL POWER PLANT

In the past few decades, Hitachi has established its leading position in supercritical power generation technology in the global market. In North America, Hitachi has provided boilers and turbines for five supercritical units in the 500 MWe – 900 MWe size range. The latest project currently under construction is the 900 MW Duke Cliffside unit #6 in North Carolina which will have a supercritical boiler supplied by Hitachi Power Systems America, Ltd.

With main steam temperature of about 600 °C (1112 °F) the state-of-the-art supercritical plants can have a net efficiency of up to 42% on a HHV basis, compared to the current U.S. coal fleet average of 33-34% HHV. The next generation ultrasupercritical power plant will use the 700 °C (1292 °F) steam cycle. The 700 °C plant will have a net efficiency of about 45-46% HHV and will emit 25-30% less CO2 than that of today's average coal fleet on per kWhr output basis. Hitachi has extensive R&D in material development and fabrication, boiler and steam turbine design. We anticipate the first 700 °C power plants to be available within a decade.

Dr. Song Wu is Director of Advanced Technologies for Hitachi Power Systems America, Ltd. in Basking Ridge, New Jersey. He is responsible for advancing the company's core technologies and planning for technology and product strategy. He is a key member of Hitachi's global taskforce for directing its thermal power technology development.

Dr. Wu joined Hitachi in 2006 with over 20 years of experience in process design, product development, and research.

ADRIAN TUCK

Adrian Tuck is CEO of Tendril

Adrian Tuck is the CEO of Tendril, the leading Energy Platform company that delivers end-to-end consumer engagement products, applications and services as well as integrated solutions for utilities such as Demand Response and Energy Efficiency. Tendril's platform, Tendril Connect™, is an open, secure and scalable solution that creates a dialogue between energy service providers and their customers as well as third party ecosystem partners like smart appliance and electric vehicle manufacturers.

Tuck has more than 20 years of executive management and leadership experience. As CEO, he focuses on expanding Tendril's customer base through multiple sales and marketing channels, including alliances with leading companies. His work extends far beyond the business itself to play a significant role in shaping policy and protocols that will best benefit the industry. He was recently selected as a World Economic Forum Technology Pioneer, and is also the vice-chair of the ZigBee Alliance, an association of companies working together to enable reliable, cost-effective, low-power, wirelessly networked, monitoring and control products based on an open global standard. Prior to Tendril, Adrian served as both interim CEO and executive vice president of Ember Corporation, a leading semiconductor provider to the Smart Grid, where he guided the company's market strategy through its critical early-growth stage. He received his education at the Royal Military Academy Sandhurst, the British Army's prestigious officer training academy.

Tuck believes we are on the cusp of a profound energy revolution that has deep economic potential for this country. "We believe the transformation of the energy economy will be every bit as great as the transformation of the information and communications economy we have witnessed over the past 20 years. We see similar sustained wealth and job creation opportunities for the nation if we seize the initiative," said Tuck.

INDUSTRY / POLICY INVOLVEMENT

Tendril's strategy has always involved active participation in the larger conversation around energy, including policy and industry standards development, public advocacy and more. In 2010, Adrian was invited to Capitol Hill to address the Senate Committee of Commerce, Science and Transportation about the adoption of energy efficiency technologies and platforms, providing testimony on smart grid technology issues and participating in the White House's 2009 Smart Grid Technology Leadership Meeting. He shared insight earned as an entrepreneur, business leader and advocate for consumers, including the changing relationship between utilities and their customers; in-depth consumer engagement research; and why open, industry standards are key to a rapid development and adoption of the smart grid.

Tendril was also recently appointed to the COMPETE Coalition Board of Directors, a position which will enable Tendril to advance the nation's electricity needs and environmental objectives and support well-structured competitive electricity markets for the benefit of consumers.

TENDRIL CONNECT™ PLATFORM

The heart of all Tendril solutions is the Tendril Connect™ platform, a unique, open and standards-based, end-to-end solution that gives utilities and their customers the ability to deploy and take advantage of tomorrow's smart energy solutions today. Utilities and their consumers are empowered with data and analytics about energy consumption, helping to drive down costs, lower environmental impact and realize operational efficiencies.

Consisting of an integrated suite of utility and consumer applications and robust APIs, Tendril Connect creates a dynamic two-way dialogue between utilities and their customers that results in improved customer participation and satisfaction with energy efficiency and Demand Response programs. The result is improved compliance with PUC mandates as well as long-term operational efficiencies.

CONSUMER RESEARCH AND ENGAGEMENT

Another key emphasis of Tendril's work has been research to better understand the end-user – how to engage and inform them such that they desire to actively manage their energy consumption. Research conducted throughout 2010 revealed several key findings about what consumers want and how best to reach them. The results of this study helped to define the face of large-scale deployment of energy efficiency services. Most notably, the research revealed that among a select survey group, interest in active energy management is high, and that internet-based services are preferred over dedicated devices. Essentially, consumers want to access information in places that they already are.

The research provided Tendril with invaluable insight to inform the continuing efforts of providing the most powerful customer engagement experience possible, and resulted in the further development of products and technologies.

Simultaneously, Tendril did extensive consumer research around product preferences and use motivators, and then tested the prototypes using the knowledge gained from this research. The result was a consumer-designed user interface and user experience meeting the mutual needs of the energy providers and their customers.

As the company moved forward it became apparent that even with this rich product solution, Tendril needed to truly engage consumers and bring about material and sustained change to achieve the long-term benefits to meet the business case for all stakeholders. This led to a key acquisition in 2010 of a company called GroundedPower, a Massachusetts-based provider of real-time energy awareness feedback to consumers of municipal utility companies that applies behavior and cognitive psychology science to leading technology companies.

The results of this research, as well as the marriage of GroundedPower's behavioral science expertise with the Tendril Connect™ platform/technology, allowed Tendril to bring to market our newest product, Tendril Energize™ – an energy efficiency solution designed to value to both utilities and customers, reducing costs and improving reliability while embracing new technologies like Smart Appliances, Electric Vehicles and Distributed Generation.

TENDRIL ENERGIZE™

Tendril Energize is the culmination of a 2-1/2 year journey of learning and groundbreaking technology advancement, both within our company and with the industry in general. As expressed earlier, the first leg of the journey was learning about the market with an eye to understanding and quantifying the business case for all stakeholders. This was an iterative process of information gathering, prototyping, segmenting and modeling the business case and toolset. Information gathering has been from a variety of sources, including industry analysts and other experts, utility executives, customers, and others.

Tendril Energize is the industry's first-ever application suite based on proven behavioral science techniques that provides utilities with simple, easy-to-use tools that deliver increased, persistent consumer engagement in home energy performance. It provides for important demand side energy management functions that utilities, regulators and consumer advocates find increasingly imperative to create a more efficient and effective power system. The suite includes important utility applications for energy efficiency; dynamic pricing programs; Demand Response; direct load control; electric vehicle and appliance management; and, eventually, distributed generation.

PARTNERSHIPS

Forging industry partnerships is a key part of the Tendril strategy. To gain the necessary edge in this fast-moving industry, it is critical to create the smartest and strongest partnerships with leading companies. Launched in 2009, Tendril's Partner Program is an open, dynamic community of technologies and service providers, including meter and AMI backhaul technologies, Home Area Network (HAN) technology providers, utility billing and customer care systems and other third-party energy management service providers. Partners currently include leading energy ecosystem vendors such as: GE, Intel, Itron, Silver Spring Networks, Landis + Gyr, Energate, Entek, CURRENT, Utility Integration Solutions Inc. (UISOL), ThinkEco and many others. Below are highlights of Tendril's recent partnership initiatives:

LOCKHEED MARTIN

Tendril and Lockheed Martin formed a partnership to collaborate in the delivery of integrated Demand Response solutions, integrating Lockheed Martin's SEEload™ Demand Response Management solution with Tendril's energy management platform. The integrated solution provides a comprehensive demand-side management program that gives consumers greater control over their energy consumption and enables utilities to deploy comprehensive, secure and standards-based Demand Response programs.

UISOL

Tendril's most recent partnership with UISOL involves a collaborative project providing residential price responsive demand. Using Tendril Connect™ and UISOL's Open Automated Demand Response (OpenADR) price server, the project allows PJM to test the end-to-end integration of a real-time Price Response Demand program and better manage electricity demand. This is a real-world demonstration to show the feasibility and ease of how residential customers can reduce their energy consumption in response to wholesale price signals that reflect grid conditions. It also shows how utilities can aggregate Demand Response in consumers' homes for better load control, increased efficiency and additional savings.

WHIRLPOOL CORPORATION

In January 2011, Tendril unveiled a relationship with Whirlpool that is setting the stage for the roll-out of smart home appliances in the U.S. Tendril's platform will support the commercial deployment of Whirlpool's smart appliances, including a range of connectivity enabled services and applications. This marriage of technologies will provide consumers with a desirable solution to better manage their energy usage.

"As understanding increases around the possibilities of our Tendril Connect™ platform, our utility partners are asking us for help in finding strategic distribution partners that can deploy smart energy technology to their customers and engage them in product selections," Tuck said.

As a pioneer in the smart grid realm, Tendril has been an active part of a quickly changing industry where only the nimblest and smartest companies will prevail. From the beginning, Tendril has played an active role in a variety of interconnected areas – government policy, industry standards, public advocacy, and utility-facing and consumer-facing technology – and will continue to do so well into the future.

JEREMY EATON

Jeremy Eaton is Vice President Honeywell Energy Solutions

WORLD-GEN: WHAT PERCENTAGE OF HONEYWELL'S PORTFOLIO IS LINKED TO ENERGY EFFICIENCY?

J. Eaton: Nearly 50 percent of Honeywell's portfolio is linked to energy efficiency. Our energy-efficiency products can control nearly two thirds of all energy consumption in homes and buildings. In fact, if Honeywell's existing portfolio of energy-efficiency technologies were immediately and comprehensively adopted, the U.S. could reduce its energy demand by 20-25 percent.

WORLD-GEN: PLEASE DESCRIBE HONEYWELL'S COLLABORATION IN THE OPEN ADR ALLIANCE?

J. Eaton: Honeywell is among several leading smart grid industry organizations in the OpenADR Alliance, which is a nonprofit corporation that aims to foster the development, adoption and compliance of Open Automated Demand Response (OpenADR), a Smart Grid standard.

OpenADR is a price-and reliability-based demand response communication specification, and national standards work will be built upon the OpenADR specifications published by Lawrence Berkeley National Laboratory. In fact, we partnered with Lawrence Berkley to develop the initial standard and Akuacom, which Honeywell recently acquired, was also instrumental in development. The National Institute of Standards and Technology and U.S. Department of Energy (DOE) selected the specification for inclusion in first wave of smart grid standards.

Honeywell is one of more than 60 control vendors across the globe that has already implemented OpenADR. However, Honeywell's formalized participation in the alliance, along with the participation of other organizations, will help promote and spread widespread adoption of the standard — and ultimately lower the cost, improve the reliability, and accelerate the speed of Auto DR and smart grid implementations across the U.S.

WORLD-GEN: DO YOU THINK INDUSTRIAL FACILITIES TEND TO BE OVERLOOKED IN THE SMART GRID MIX?

J. Eaton: Yes and no. In many ways, large industrial facilities have been "smart grid ready" for years because they've had to be. First, they are large energy consumers, and in many cases they are already on some form of variable price tariff. Also, they often have made investments in equipment and controls to help them manage their energy because they've had to. As a result, we see an opportunity to fully link this existing capability with utilities in an automated fashion, and to fully use these loads to help manage the grid.

Another significant opportunity lies in with smaller industrial facilities, which haven't necessarily had the stand-alone business case to make the necessary investments. One might argue that these smaller industrial facilities have been overlooked in the smart grid mix, because a lot of the smart grid investment has been targeted at residential customers. Moving forward, the issue is going to become even more pressing as utilities move to new pricing structures, like critical peak pricing, and look to enroll more commercial and industrial customers into demand response and related programs.

A prime example of this scenario is occurring right now in the Southern California Edison (SCE) service territory, where the utility is rolling out a critical peak pricing structure for commercial and industrial facilities. This means that they will see the cost of electricity jump up to 14 times the normal rate when SCE needs to respond to unusually high demand. It's expected to happen 10-15 times per year — the hottest days of the summer — and could result in thousands of dollars in additional expenses.

These commercial and industrial facilities thus need a way to control their energy usage in an automated fashion to effectively respond to price changes. And until recently, that's been the challenge. Automated demand response (Auto DR) programs, however, are proving to be a useful solution. Auto DR gives companies complete control of how they respond to fluctuating prices, helping reduce costs with minimal effort.

Honeywell is delivering an Auto DR program for customers in the Southern California Edison territory to automatically respond to peak demand events. We're aiming to enroll enough customers in the program to give SCE a total megawatt shed of 80+ megawatts.As part of the program, we're essentially providing the critical link that's been missing until now: a direct link between utilities and customers to share critical energy information, which is a key ingredient to making the smart grid work for everyone.

WORLD-GEN: PLEASE MENTION HONEYWELL'S ACQUISITIONS AND LAUNCHES IN THIS SPACE?

J. Eaton: In 2008, Honeywell launched its demand response thermostat, UtilityPRO™, which gives homeowners the ability to better manage energy use and reduce energy expenses. It's become a staple among utility-sponsored demand response programs across the U.S., including those programs with Baltimore Gas & Electric and CPS Energy.

In 2010, we reached a significant milestone when UtilityPRO become the fastest-selling thermostat for utility-sponsored demand response programs. Since the technology was introduced in 2008, Honeywell has shipped more than 350,000 of the touch-screen programmable thermostats, which give utilities control over peak consumption while helping homeowners cut energy costs. Thirty-three utilities in the United States and Canada have already selected the thermostat for their demand response efforts. By 2011, Honeywell expects UtilityPRO will give these utilities combined control of more than 500 megawatts of peak energy use — equivalent to the generation capacity of approximately 10 gas-fired peaking plants.

In 2010 Honeywell also announced the addition of "time-of-use" programming to its Honeywell's Prestige™ programmable thermostat, enabling homeowners to automatically adjust their energy consumption based on a utility's variable pricing plan—and further bringing the benefits of the smart grid into their homes.

Also, within the past year, Honeywell has made a couple acquisitions. In spring 2010, Honeywell acquired San Rafael, Calif.-based Akuacom, a leader in automated demand response technology and services for the smart grid. The Akuacom Demand Response Automation Server provides utilities and independent system operators (ISOs) two-way communication with energy management systems at commercial and industrial sites. So, it essentially firms up the communications path between utilities and their industrial facilities. This gives utilities and ISOs the ability to automate the delivery of price and reliability signals to these facilities, and more effectively trim peak demand, adding to Honeywell's energy management and smart grid portfolio.

In July 2010, Honeywell acquired E-Mon, LLC, a manufacturer of electric submetering products and systems that help companies better understand and control energy use and costs — critical capabilities in a smart grid environment.

WORLD-GEN: HONEYWELL HAS RECEIVED DOE INVESTMENT GRANTS. PLEASE PROVIDE RESULTS?

J. Eaton: In 2009, Honeywell received an $11.4 Million grant to use automated demand response to implement a critical peak pricing response program for commercial and industrial facilities in the SCE service territory (this is the program detailed in the previous answers). Results are not yet final, but ultimately the program will enroll enough customers to provide the utility with control of 80+ megawatts of peak energy use.

Since launching the program in 2010, we've already connected with hundreds of customers, and we either have enrolled or are working to enroll them in the program. Customer feedback has been very positive, and we've received a lot of interest from varying types of customers within the SCE service territory, including manufacturers, big box retailers, universities, school districts, commercial facilities and recreational facilities.

We originally set out to enroll 700 customers. However, we're finding that the opportunity is greater than expected, and we actually will likely need fewer customers to reach our goal because customers have more shed capacity than anticipated. As a result, our total megawatt shed goal of 80+ megawatts won't change, but the total number of customers we end up enrolling likely will shift.

Among other smart grid grant connections: Honeywell received an R&D grant that includes testing to help reduce downtime and failures of wind turbines. Funding will also go toward developing a controls infrastructure for optimizing renewable energy micro-grids.

Additionally, Honeywell also received a $2.2-million grant to research, develop and commercialize a "role-based access control" system for grid security to restrict access to only authorized users. And other grant award recipients are tapping Honeywell to help implement smart grid projects, too. The city of Quincy, Fla. is using grant money for an automated metering infrastructure (AMI) program, which Honeywell is helping implement.

WORLD-GEN: WHERE DOES HONEYWELL SEE THE GROWTH IN THE INTERNATIONAL SMART ENERGY MARKET?

J. Eaton: Huge potential for growth exists worldwide, including areas like China, Hong Kong, India, Australia and the United Kingdom. For example, buildings are the single biggest contributor to Hong Kong's energy consumption and are responsible for an estimated 65 percent of total demand. We're involved in Auto DR pilots with utilities in these areas, and we're examining their feasibility with an eye on launching more programs internationally, because we definitely think there are many opportunities — particularly among commercial and industrial customers.

One of the reasons opportunities exist with this customer segment is due to the fact that buildings are largely similar from country to country, in terms of the type of building equipment and technology they use. In contrast, residential homes vary from region to region. As a result, we're seeing many opportunities to take the technology that's so far proving successful in Auto DR programs here in the United State and apply that technology globally, to commercial and industrial facilities around the world.

Also, in light of rising energy demand both in the region and globally, and constraints in generation and distribution — not to mention fluctuating energy prices — increasing attention is being paid to energy efficiency and demand management in this area. As a result, we're seeing growing demand for smart grid-related projects in general.

JANE ALLEN

Jane Allen is the Electric Utilities Leader Deloitte Canada

DEVELOPMENT OF THE SUPPLY CHAIN: THE WEAKEST LINK?

For many renewable energy projects the next major challenge is whether the current supply chain is capable of supporting the planned levels of investment. In many countries, the supply chain is underdeveloped and it will have to grow significantly if the targets for energy generation are to be met. This growth will be organic and through M&A and offers opportunities for investors such as venture capital and private equity – who have traditionally preferred investment in downstream technologies rather upstream generation. Canada, the European Union (EU) and China offer an insight into the opportunities.

With the U.S. buying close to half of its wind turbine parts outside of North America from China, among others, a strong market opportunity exists for Canada to become a major supplier. Canada is in a good position to serve U.S. wind developers given that it is risky and expensive for them to import turbine parts from other areas of the world. Market potential is great in wind manufacturing given that a turbine is comprised of roughly 8,000 separate parts and their production requires highly skilled trades and quality manufacturing facilities. Manufacturers are attracted to Canada because of wind energy growth spurred on by the Ontario government's aggressive feed-in-tariffs and requirements in various provinces that a percentage of goods and services for solicited projects come from domestic sources. For Canada to be successful, there needs to be a long-term commitment to renewable energy development that will create certainty for manufacturers, since historically there have been peaks and troughs in demand for wind power because provinces tend to issue related solicitations on a sporadic basis.

Similar developments are occurring in the EU, as the region is counting on a record level of offshore wind construction to reach its 2020 renewables target. This development is expected to take place not just in the UK, but other countries with offshore resource including France, Germany, Belgium, the Netherlands and Denmark. The supply chain is currently delivering around 1GW of installed capacity, but to reach the 2020 projections the EU will have to rise to nearer 10 GW. This translates to potential compound growth of 10 percent per year. Much of this growth will be achieved in ways that have not been invented yet and require investment in skills, research and development (R&D) and technology.

Companies like Siemens, GE and Mitsubishi have recently announced that they will be developing UK facilities dedicated specifically to offshore wind. In developing the supply chain, it is also worth recognizing that it comes with associated risks; continuity of supply, counterparty integrity, sustainability of materials used, and export controls are just some of the areas to get right if the growth potential is to be realized.

One of the major trends in the supply chain arena involves China. As the world's largest cleantech investor since 2009, China is well established as a source of manufacturing prowess. However, a shift is underway –China is not just an investor and exporter, it is also becoming a source of innovation. This shift is driven primarily through several government investments in R&D and innovation incubators.

The Chinese government has several goals in their five year science and technology plan to reduce China's reliance on foreign technology, increase domestic contributions to technology and the numbers of Chinese workers in the field. China has over 1,600 government-run incubators and science parks – many of these involve cleantech projects. In addition, China is bucking the trend of decline in global patent filings brought on by the global economic crisis. China is now fourth in the world in patent origin in six clean technologies including wind, biomass and clean

(continued page 23)

CLASS OF 2011

BARRY WORTHINGTON

Barry Worthington is the Executive Director of USEA

Barry Worthington is the Executive Director of the United States Energy Association where he directs the Association's domestic and international activities. He has served in this capacity since 1988. Prior to that, he was a Vice President of the Thomas Alva Edison Foundation and earlier served in several capacities with Houston Lighting and Power Company, now known as CenterPoint. He is on the Environmental Protection Agency's National Advisory Council for Environmental Policy and Technology, the Advisory Council of the Electric Power Research Institute and is a Director of the National Energy Foundation and Trustee of the Energy & Mineral Law Foundation

The United States Energy Association (USEA) exists to be the United States Member Committee of the World Energy Council (WEC), a role it has performed since 1924. Its relationship with counterparts in the other 95 countries that are members of the WEC proves valuable to our members as well as to the United States Government agencies that we partner with to execute specific programs and projects.

After completing the highly successful World Energy Congress in Montreal in September of 2010, WEC turns its attention to the North American Forum scheduled for Houston, Texas, October 31 – November 1, 2011. World Energy Council returns to Houston for the first time since the 17th Congress in 1998. Canada, Mexico, as well as the United States will play host to twenty countries to discuss global issues of the day. "The Global Integrated Energy Business" will be the primary theme. Business discussion sessions will include:

- Global Nuclear
- Global Coal
- Global Gas
- Global Renewables
- Global Deep Water
- Global Smart Grid

World Energy Council programmatic sessions will include:

- Assessment of Energy and Climate Policies
- Carbon Capture and Storage for Enhanced Oil Recovery
- WEC Energy Scenarios
- Energy and Mobility
- Energy Efficiency
- Innovative Financing

This Houston Forum will bring senior executives and government officials from all around the World that have business in the North American energy space.

USEA does much more than serve its primary function as our nation's affiliate with the World Energy Council. U.S. government agencies find our domestic membership structure and international reach to be highly useful to pursue U.S. international strategic interests. In 2010, USEA organized the U.S.-Poland Energy Roundtable in Washington, DC and will organize the follow-up program in Warsaw in 2011.

South Asia energy executives learn best practices from American counterparts through the South Asia Regional Energy Institute sponsored through USEA by the U.S. Agency for International Development. Cooperation in Eastern Europe is encouraged by the Black Sea Regional Transmission System Planning Partnerships also funded by USAID.

China is a major focus of USEA. In 2010, the U.S.-China Fossil Energy Protocol meeting was organized by USEA in San Francisco for the U.S. Department of Energy. China will host the 2011 session with USEA helping to coordinate the U.S. private sector involvement. Similarly, the Annual U.S.-China Oil & Gas Industry Forum (OGIF) was held in September in Fort Worth, again sponsored by the U.S. Department of Energy with support from USEA. OGIF will be held again in 2011 in China with USEA assisting the U.S. Department of Energy with private sector participation.

Carbon capture and storage is front and center both for the global energy industry and governments in both developed and developing countries. Can our industry quickly deploy dozens of CCS demonstration projects to prove the technology at scale and drive down both the costs and the parasitic load? International cooperation is essential to successful deployment of demonstration projects.

USEA seeks to further our members and our national interest regarding CCS in many ways. Spencer Abraham, then Secretary of Energy asked USEA to assist the U.S. Department of Energy in organizing the inaugural Carbon Sequestration Leadership Forum (CSLF) in Washington in 2003. Ministers from eighteen countries launched the primarily international collaborative to cooperate on CCS Research, Development & Deploy. Dr. Steven Chu, current Secretary of Energy continued supporting CSLF by participating in the London Ministerial in October of 2009. Beijing will host the next Ministerial in 2011.

Additionally, the World Energy Council's Cleaner Fossil Fuel Systems Committee has a sharp focus on CCS with USEA serving in a coordinating role. Both CSLF and the WEC effort have facilitated industry and government dialogue on CCS issues such as siting and permitting, short and long-term legal liability; monitoring long-term storage; public acceptance and the need to share best practices. USEA's track record in facilitating best practice sharing was one reason that the Australian based Global Carbon Capture & Storage Institute selected the Association to conduct capacity building programs as GCCSI reaches out to support technology and knowledge transfer to developing countries.

USEA's educational role is enhanced by a variety of major annual forums, including:

- State of the Energy Industry – January
- Annual Membership Meeting & Public Policy Forum – April
- Energy Efficiency Forum – June (in conjunction with Johnson Controls)
- Energy Supply Forum – October

Additionally, membership briefings are open to not just USEA members, but to Congressional staff, U.S. government agency staff, the news media, foreign embassies located in Washington and think tanks. These briefings cover key issues such as environmental friendly drilling, smart grid applications, the nuclear renaissance, renewable technologies and much more.

Recently Washington has focused attention on shale gas developments and particularly the Marchelleus Shale formation in West Virginia, Pennsylvania and New York. Issues surrounding economic development and job creation are top of mind for policymakers as the economy continues a painfully slow recovery. Environment issues, particularly regarding water supplies, and water treatment have also gained attention. These were discussed at length during Penn State Energy Day in Washington, in November, 2010, which was hosted by USEA. Each major policy forum takes up shale gas development as Washington policymakers will need to be mindful of the balance between economic development and environmental protection.

The international ramifications of shale gas development are being better understood. Cooperation with Poland, Ukraine, China and other countries is heavily influenced by American companies (USEA members) leading the world with shale gas technology and know-how. "Game Changer" is the terminology widely being used to describe the phenomenon of this resource in terms of abundance and price.

Many point to the new job opportunities being created by shale development. Various industry sectors vie to claim the number of direct and indirect jobs created by their sector. USEA reminds people that every job in the United States requires that a reliable and affordable supply of energy, in whatever form, is available. Very few jobs would be available if our industry was not able to provide energy for transportation, manufacturing and commercial activity.

One significant goal of USEA is to recognize industry leaders for their contributions to our industry, our nation and for that matter, to the world energy community. Three major initiatives are utilized to help accomplish this objective.

Each year USEA recognizes a single energy leader with the presentation of the United States Energy Award. Peter Robertson, retired Vice Chairman of Chevron was the 2010 Recipient. Robert Catell, Former Chairman and Chief Executive Officer of KeySpan (now National Grid – US) received the award in 2009. Prior recipients include Lee Raymond, the Chairman & CEO of ExxonMobil; Stephen Bechtel, Jr., Chairman Emeritus of the Bechtel Group, and Daniel Yergin, one of our industry's best known experts.

Proponents of energy efficiency are recognized annually at the USEA-Johnson Controls Energy Efficiency Forum. Award categories include:

- The Congressional Award
- The Governor's Award
- The Mayor's Award
- The Public Service Award
- The International Award

In 2009, two-dozen stars of energy efficiency were highlighted by induction to the Energy Efficiency Forum Hall of Fame. These individuals included former Secretaries of Energy Jim Schlesinger, Hazel O'Leary, and Spencer Abraham. Also recognized was Duke Energy Chief Executive Officer, Jim Rogers, Pennsylvania Governor, Ed Rendell, and New York Times Columnist and Pulitzer Prize Author, Tom Friedman.

Corporations are also recognized that participate in USEA voluntary partnership activities. Great American companies have shared best practices with industry peers in over 50 countries. While a large focus has been the electric power business, numerous activities have involved the oil and natural gas industry. The energy partnership concept, which started in Poland, Hungary and then Czechoslovakia, proved so successful that the U.S. Agency for International Development supported their expansion to other countries in East and Central Europe, Central Asia, Asia Pacific, Africa, South American and the Caribbean.

Examples of corporations that have been recognized include:

- Southern Company
- Otter Tail Power Company
- Sacramento Municipal Utility District
- Baltimore Gas & Electric
- American Electric Power Company
- Bonneville Power Company

Regulatory commissions have also participated in the USEA Volunteer Partnership programs and have also been recognized at award ceremonies. These award recipients include:

- Federal Energy Regulatory Commission
- Pennsylvania Public Utility Commission
- Public Utility Commission of Texas
- Public Utility Commission of Ohio

On April 3, 2006 President George W. Bush presented the USEA volunteers by way of a letter from the White House. President Bush wrote "I appreciate the USEA, the volunteer award recipients and all those who are committed to advancing energy partnerships and energy efficiency. Your efforts help deliver a better life for people everywhere." Volunteers are today continuing to share best practices with activities involving India, Bangladesh, Nepal, Sri Lanka, Pakistan, Afghanistan, the Central Asia Republics, Jordan, Iraq, Russia, Ukraine, and China.

USEA will continue its mission to bring about a greater understanding of energy issues. It will continue to represent the United States in the World Energy Council and its mission to inform the Washington energy policy community regarding the critical issues of the day.

JERRY ROBINSON

Jerry Robinson is the Managing Partner for Strategic Contract Resources, LLC

Few executives in the Power Industry rank and qualify their product using quantifies such as Motivation, Behavior, Ability, Experience, Judgment, Education and Temperament. Yet, that is how Jerry Robinson has spent most days since entering the energy industry over 20 years ago. As the Managing Partner of Strategic Contract Resources, LLC (SCR) he and his team of associates use these evaluation skills to provide contract technical personnel and direct-hire recruitment services to the nuclear, fossil and renewable power industries worldwide. Robinson states, "matching the power industry's ever changing needs for personnel with the right-fit talent continues to be the most important task faced by energy industry leadership at all levels." He continues,"helping facilitate this match requires a combination of analyst, therapist, recruiter and career counselor. Our industry's aging workforce, project cycles, and drive toward greener technologies, all impact how our workforce is built. It demands that the right talent, which is needed across all aspects of the industry, be readily available."

In 1988 he was drawn into the staffing arena when asked to implement an accelerated growth strategy model he developed. The request came from a then fledging provider of consulting personnel which soon became a premier source of industry talent. With responsibility for all growth initiatives he was soon hiring, mentoring and developing a key group of individuals who now own, manage, or run eight recruitment and staffing firms with an extended reach across the industry. In 2003 he partnered with a team of previous associates and took the reins of SCR. SCR has since become one of the fastest growing providers of personnel to the energy industry with representation and assignment experience across five continents. Robinson's route to becoming a recognized, influential and successful talent broker grew from a basic understanding that everything – production, growth, and company success all stems from having the right people in the right environment. He comments, "being able to accurately understand work environments, whether they be corporate, project, or production; and match and attract the proper candidate comes naturally when you truly listen to your clients and candidates. Active listening skills allow the client's needs to be heard and the candidate's abilities to be understood."

Robinson now focuses on managing SCR's daily operations which span the world. Its services include personnel delivery to the power, petrochemical, and oil & gas industries. He also continues to selectively personally provide recruitment services on executive and director level positions.

World-Generation met with Mr. Robinson during Power-Gen 2010 and gained his thoughts on the power industry's opportunities and challenges as they relate to employee resources. He offered an overview of power industry staffing and recruitment including his views on the industry's current status, future needs and his insight on high-impact issues the industry faces.

THE PRESENT:

Employers. The appetite for top industry talent has never been more evident. Staffing companies are currently responding to an exponential increase in calls for people. These requests are primarily for direct-hire talent with a strong indication of an impending increase in need for project-to-project staffing. Companies including developers, constructors, operating companies, utilities and virtually every link in the power industry's supply chain have again begun to collect talent to fill existing and anticipated needs. Three areas are driving the industry's demand: engineering staff to support new technology, operations personnel, and sales staff. The most severe and time critical need is in the disciplines which support green renewable technologies. Hiring is experiencing an upsurge in disciplines such as sales, engineering, product development, construction management, health & safety, electrical/mechanical, sales and marketing. But other requirements are coming from less frequently connected positions – accountants, human resources, information technology and technical writers. Thus, the need is broad and with continued emphasis on nuclear and wind the numbers could be substantial. A small example of the need is the Department of Energy's report outlining a 20% concentration of energy from wind by 2030 in the U.S. An increase from 50,000 U.S. jobs to 500,000 in the next 20 years has been reported as a potential result solely in wind industry growth.

Candidates. While the depressed U.S. housing market continues to make relocating candidates difficult, the interest in U.S. workers accepting positions abroad has increased with a higher number of candidates willing to look and accept overseas assignments. International firms actively involved with recruitment have been ahead of the curve on acknowledging that the best talent still commands top wages. The more savvy employers have realized that while the perception is that it is an "employer's market", the reality is that the most productive personnel have for the most part retained their positions and must be enticed to make a career move. Attracting top performers now goes well beyond salary increases as a heavier value is placed on lifestyle, location, opportunity, and corporate culture. And, recruiters are more commonly hearing that if the fit is right candidates are more willing than ever to consider new challenges. There appears to be a feeling from middle management that they've been required to "do more with less" these past few years contributing to diminished loyalty. Reality or not, the thought process has a hold on many candidates which in turn carries weight on career decisions and a more evident readiness to listen to new opportunities.

THE FUTURE:

Staffing initiatives require your devoted attention now. The draw on talent is going to explode as the industry competes to replace lost personnel as the baby boomers leave our ranks. We as an industry have been lucky to enjoy one of the few positives of the economic downturn – delayed retirements caused by deflated values in retirement accounts. However, as these values return the tenured brain trust of the energy industry workforce will experience an accelerated departure. This exodus will be across all disciplines, throughout providers of services and products and right onto the turbine, boiler, and reactor floors. The most experienced and knowledgeable sales personnel, executive leadership, technical advisors, and operations talent will pack their briefcases, turn in their tools, and walk out the door. The competition to replace these losses will be severe. Now is the time for responsibilities to be transitioned to the next generation of workers. We must take the opportunity and use the experience still at hand to train, cultivate and mentor new talent. The investments made today will pale in comparison to the potential losses which are possible without a proper hand-off of knowledge and expereince.

Each one of us needs to become an outspoken advocate for Power Industry recruitment. As an industry we all need to be working together to promote, speak to, and recruit new talent to our industry. This has been a great industry, a huge part of America's success, and largely stable for decades, and our industry can continue to serve the career needs and desires of generations to come. It will provide fair opportunity and security by offering excellent earnings, stable work environments, and incredibly interesting career paths. But, we must do a better job of broadcasting that message. Over 10 years ago, the aging workforce issue hit the energy industry's radar screen. Now these many years later little has changed in attitude or level of concern. Yes, we've been lucky and able to enjoy a few delays caused by exterior factors, but we should realize the inevitable and make positive moves forward. As the problem will hit multiple related sectors including power, oil & gas, petrochemical, pulp & paper, we will have stiff competition against industries in similar situations. The clock is ticking.

HIGH IMPACT INFLUENCES:

Economic & Energy Policies. Even considering strengthening demand for candidates, the true need for staff additions continues to be artificially depressed. Hiring is well below need as many employers continue to defer direct-hire commitments while awaiting more certainty in the areas of economic and energy policies. Decisions are being made on absolute need rather than desired additions. The cry from the industry is that open positions need to be filled, money to invest in talent is available, yet they "need to know a little more" about the direction of the final demand and strength of the industry prior to adding on-staff personnel. One result has been the move toward a more flexible work force. In order to fill their needs, companies are circumventing the direct-hire commitment by using temporary labor. In conjunction with this, more users are demanding that the temporary agencies offer the temporary workers full benefit packages. In this manner, while the commitment to the worker can be temporary, companies are protecting their contingent workforce and reducing the possibility of the worker being easily hired away. Temp-to-perm conversion language has become standard inclusion in the agreement between the agency and employer furthering the company's chances of gaining full value from these relationships.

Healthcare. The issue remains one of the most discussed problems facing industry and human capital plans. With ongoing battles for legislative and funding control, differing opinions on effectiveness and responsibility; and the potential for continued cost increases our industry's best course is still unknown. Regardless of the eventual outcome we are being forced to weigh options using a matrix of short-term, mid-term, long-term strategies evaluated against an unclear time schedule of questionable implementation. SCR is in a somewhat unique position as it insures its own in-field workforce while supporting the recruitment needs of its clients. Not an easy task, but SCR's philosophy has been to take a pro-active approach by working closely with its vendors to outline a road map of contingencies based upon Washington's decisions and our client's and employee's needs. Everyone we touch is in a competitive environment and we continue to work hard to be tuned in to both employers' and employees' circumstances. We are continuing to evaluate and position ourselves to insure that cost effective health care is an achievable goal regardless of the final delivery method. This includes insuring our contingency workforce while working with clients to help them communicate their benefit plans to future direct-hire employees.

We believe that one of the most probable solutions will be the outsourcing of employment and benefit packages to 3rd party employers-of-record.

TODD GRZECH

Todd Grzech is Senior Vice President of PIC Group, Inc.

Todd Grzech is Senior Vice President of PIC Group, Inc., a global power generation service provider. Grzech leads one of the company's most successful divisions, Technical and Consulting Services (TCS). This division touches on three of the company's six service lines. As such, Grzech is a man of many talents. "Whether it's a start-up job in Nigeria or a staffing project in Peru, I never know what the day will bring my way," smiles Grzech.

Grzech's interest in the power industry began in college. He graduated from Purdue University with a degree in Engineering and participated in DuPont's Co-Op program at the Savannah River Site, a nuclear facility in South Carolina. Grzech subsequently garnered his MBA from Purdue University as well, and his career with PIC started a few years later in 2001. Now a 10 year veteran of PIC, Grzech has worked on projects of all types and in locations all over the world.

Grzech has seen PIC grow from a small company with an "entrepreneurial spirit and mission for growth" into part of an international conglomerate. Originally founded as an industrial staffing company in 1988, PIC is now a wholly owned subsidiary of Marubeni Group, a publicly listed company headquartered in Tokyo, Japan with $41.1 billion in revenue. Taking advantage of Marubeni's financial support, global reach and expansive network, PIC has broadened its service lines to support the entire power project lifecycle. PIC's services include start-up and commissioning, turbine and boiler installation, turbine and boiler outage, operations and maintenance, documentation and training, and project support.

"With over 5,000 projects completed worldwide, PIC's philosophies and programs have been proven effective and continuously refined for over 20 years. This experience, combined with Marubeni's financial backing and our breadth of service offerings, is PIC's greatest competitive advantage. Our clients get a true partner; a complete service provider who understands how a service performed in one area can impact another area. To me, this is the best part of the job. Listening to our customers and understanding their needs. We don't walk into customer meetings with a predefined solution. We listen. We try to pinpoint exactly the issues that are at hand and work together to create a solution that benefits all," says Grzech.

PIC's full service approach to project fulfillment ensures a seamless execution and results in the highest quality solutions. Working together, PIC's divisions can service every part of a power plant, large or small. "We share clients, we share expertise, and most importantly, we understand the nuances of construction, of commissioning, of operations and of long term maintenance. We pull from our own experiences to offer a more complete service to our customer. For example, when my team approaches a new start-up and commissioning job, we already understand how the owner/operator views this service from working with our own, internal O&M group," explains Grzech.

While working closely with clients and fellow employees is imbedded in PIC's culture, safety is always the top priority. PIC focuses on the number zero – striving for zero injuries, zero accidents and zero harm to the environment. "Safety leads everything we do," says Grzech. "No job is successful if someone gets hurt. I always say that our job is not to perform a specific service, but rather to ensure that during the performance of a particular service no one is hurt, no equipment is damaged and the environment is protected."

No one person is responsible for safety at PIC. Instead, safety is the responsibility of each and every employee – whether out in the field or in the corporate office. PIC expects and empowers all of its employees to be accountable for their actions. "We staff our jobs with experienced personnel who come trained, equipped and ready to do their job. When you get right down to it, this is a small industry, and we know a lot of people in it. We focus on ensuring that those who work for PIC are only those with a core belief and attitude that matches our 10 PIC cultural mottos. As a service company, you're only as good as those who deliver your offerings; therefore, we work hard to make those 'The Best of the Best'."

Delivering "The Best of the Best" people and services is so important at PIC, they trademarked it. More than a slogan, this statement sums up PIC's vision as a company. "The Best of the Best' means that our people are our most important attribute," adds Grzech. "By hiring the strongest people in the industry, we've created a culture of excellence. We don't want to just be a good company, we want to be the industry standard."

Like any top company, PIC has adapted to changing market circumstances. According to Grzech, the power industry has recently begun to welcome technology as a source of process improvement. "In the TCS division, I have noticed a strong move away from working with limited planning and process, to understanding the methodology to accomplishing jobs safely and efficiently." PIC has embraced this move toward a more directed process by combining the latest technology with its field-proven programs and top-notch personnel. "Taking advantage of technology to plan, monitor and even track our progress is a huge advantage. Plants don't get started up by accident, but plenty of accidents can happen if you don't plan well."

CONNIE MIXON

Connie Mixon is the CEO of Mycelx

MYCELX PROVIDES CLEAN WATER TECHNOLOGY SOLUTIONS WORLDWIDE

By 2025 about two-thirds of the world's population of about 5.5 billion people will live in areas of water scarcity according to the United Nations.

Meanwhile, industrial operations are steadily increasing, producing a rising demand for sustainable water treatment technology, especially in growing water scarce regions. MyCelx Technologies Corporation provides Clean Water and Air Technology to industrial markets worldwide, and its patented MyCelx molecule can reliably removal oil and water soluble organics(WSOs) to very low levels in a cost-effective manner.

MyCelx was co-founded by noted inventor Haluk Alper in the wake of the Exxon Valdez oil spill as a way to effectively and permanently separate oil from water. His success has resulted in mulitple patents and clean water technology that is relied upon by industry leaders worldwide such as Anadarko Petroleum, Saudi Basic Industries Corporation (SABIC), Qatargas, EnCana and Toyota. CEO Connie Mixon's background in global markets at several investment banks provides a solid foundation for the company's rapid growth and expansion.

THE NEED FOR CLEAN WATER

Clean water technology is critical for organizations to sustainably operate, and MyCelx is quickly becoming the solution of choice, because the technology maximizes ecological sustainability. MyCelx uses proprietary air and water characterization methods to ensure every engineered solution is a success.

The resulting technology permanently captures and removes virtually all hydrocarbons from air and water in a single pass, thus reducing hydrocarbon levels to allowable limits in accordance with all state and federal, and international regulations. The technology significantly minimizes the environmental footprint, usually 1/10th of the footprint of equivalent adsorbent media such as carbon, and delivers these results with a low capital investment.

MyCelx provides unique water treatment solutions to a variety of industries such as oil and gas, commercial marine, and utilities. With the global issue of water scarcity and the EPA getting increasingly stringent on water discharge requirements, their primary market is oil and gas with high demand for treatment applications for water recycle and reuse and produced water treatment.

WATER RECYCLE AND REUSE

In water scarce regions like the Middle East, water is more expensive than fuel. Some of the largest industrial consumers of water and producers of wastewater are oil and gas drilling and production operations, refineries, petrochemical plants and manufacturing operations. It is vital that wastewater from these industries be treated, recycled and reused, and with its 15 patents, MyCelx is the one of the most significant breakthroughs to enable water recycle and reuse in 50 years.

MyCelx specializes in the recycle and reuse of industrial water, specifically when oils and hydrocarbons are present in the water. Their clean water technology is deployed in various process water and wastewater treatment applications such as, de-oiling of cooling water, recycle and reuse of process wastewater, desalination reverse osmosis pretreatment for membrane fouling protecting, offshore and onshore produced water de-oiling and storm water treatment.

With water costs ranging from $1-6 per meter cubed (m3), the Middle East spends billions of dollars every year for industrial water consumption. If 20% of the industrial wastewater in Middle East was reused, it would conserve about four million m3 of water and save over $4 billion dollars every year.

With existing methods for recycling wastewater proving to be economically challenging and inefficient, MyCelx designed a breakthrough system called Point Source Wastewater treatment. The system is designed to remove contaminants at the generating source and produce waste that can be reused as complimentary fuel. The hydrocarbon and solids-free water is processed through desalination equipment like ion exchange, reverse osmosis or evaporators for process or potable water reuse.

At the 2010 Platts Global Energy Awards, MyCelx was a Sustainable Technology Innovation of the Year finalist for the Point Source Water Treatment system they engineered and implemented with an affiliate of Saudi Basic Industries Corporation (SABIC) for treating petrochemical wastewater. The MyCelx-SABIC installation conserved water by tightening the loop between water use and re-use, which was of vital importance. The system consumed less energy treating the water at the wastewater treatment facility water and recaptured fuel from hydrocarbon by-products, which was used within the facility.

PRODUCED WATER TREATMENT

Today, there is both increased demand and environmental concern for both offshore and onshore drilling. For every one barrel of oil produced from oil and gas drilling operations, nine barrels of water are produced that must be treated and safely discharged back.

In most parts of the world including the Gulf of Mexico, the EPA produced water discharge limit is 29ppm, but oil sheen can occur at greater than 10ppm. MyCelx removes visible oil sheen and discharges to less than 10ppm, much greater than the EPA standard. MyCelx effectiveness also removes WSOs, a special class of hydrocarbons, which add to the oil content of the produced water, and are commonly found in higher concentrations in produced water from deepwater offshore operations, making it challenging to consistently meet water discharge requirements.

Oil and gas companies need a treatment system that can remove these difficult WSOs to reliably meet the 29 ppm discharge limit, and MyCelx is the only produced water treatment technology that can guarantee removal of all oil and WSOs to below 10 ppm.

O&G companies like Anadarko, EnCana, and Williams, have implemented MyCelx units in their onshore produced water treatment to enable oil sheen free discharge of the water into the environment. The MyCelx Clean Water Units at capacities ranging from 10,000 bbls/ day – 25,000 bbls/day have treated and discharged more than 15 million barrels of produced water at 10 ppm or less with no incidence of oil sheen at the discharge during the entire operational period.

Based on these onshore results, MyCelx units are currently being evaluated in deepwater Gulf of Mexico with operators like Anadarko and Chevron for offshore produced water treatment. Initial evaluations of the MyCelx unit not only showed successful removal of oils and hydrocarbons to 10 ppm in the overboard discharge but also a reduced environmental impact. Compared to other systems, the MyCelx unit is one-third the size and one-fifth the weight and generates significantly less waste. MyCelx is also much easier, safer and more cost effective to maintain than most traditional methods.

The results of the MyCelx system will impact the future of quality water monitoring in offshore drilling platform operations, and MyCelx anticipates rapid growth in Gulf of Mexico and Australia deepwater operations.

FUTURE DEMAND

MyCelx is experiencing 60% year-over-year growth and plans to expand the organization in 2011 to address the enormous opportunities they have identified globally.

Currently MyCelx operates in 10 countries and four continents with hundreds of worldwide installations. With their breakthrough technology for water recycle and reuse, they are highest growth area is in the Middle East where industrial operations are high and water is extremely scarce.

In the US, onshore natural gas production is growing, and requirements for clean, treated water are necessary for both the environmental and operations. For example, Marcellus Shale, the largely untapped natural gas reserve, is located in one of the most populated regions of the country, and significantly raises concerns over environmental footprint. Furthermore, because shale gas must be obtained through hydraulic fracturing, there is an enormous amount of wastewater produced that must be treated.

There will always be a demand for clean water, but as the world population continues to rise and there is increased scrutiny of industrial operations' environmental impact, the demand for water treatment technology solutions will also continue to grow.

JANE ALLEN

CONTINUED FROM PAGE 19

coal. China is already the largest and fastest growing renewable energy economy in the world. Their focus is not just domestic but international, and their impact will be felt everywhere.

As things stand now, the supply chain is inadequate to reach many nations' 2020 renewable energy targets. Scaling up will not be easy and is dependent on continued availability of subsidies, but should present many opportunities.

While the outlook remains strong, the following will play a key role in how rapidly the industry grows.

The relative cost and political latitude to develop other competing forms of low carbon generation such as nuclear and gas will determine the role for renewable energy in the overall energy mix.

The pace of development of shale gas may have an impact on energy security concerns as well as potentially representing a relatively efficient energy generation measure in the interim, affecting the overall shape of the energy mix. China will continue to play a key role in the sector outside its own borders, driving down costs, investing in projects and supplying key components.

With COP16 upon us, it is a reminder of how important a role the United Nations Framework Convention on Climate Change (UNFCCC) plays for the sector. The failure of COP15 to extend the Clean Development Mechanism beyond 2012 has adversely affected many renewable energy projects. At the same time, the pledge to seek up to US$100 billion per annum of additional funding for mitigation and adaptation as well as the positive developments on reducing emissions from deforestation and forest degradation has shifted focus on other ways to mitigate climate change. However, if voluntary and regulated carbon markets can develop as a result, this may help to drive renewable energy in the long-term.