

District Energy

SECOND QUARTER 2010

Indy System's Past Inspires Latest Upgrades

Challenges, Opportunities
in Detroit

New Multiplant
Control Strategy

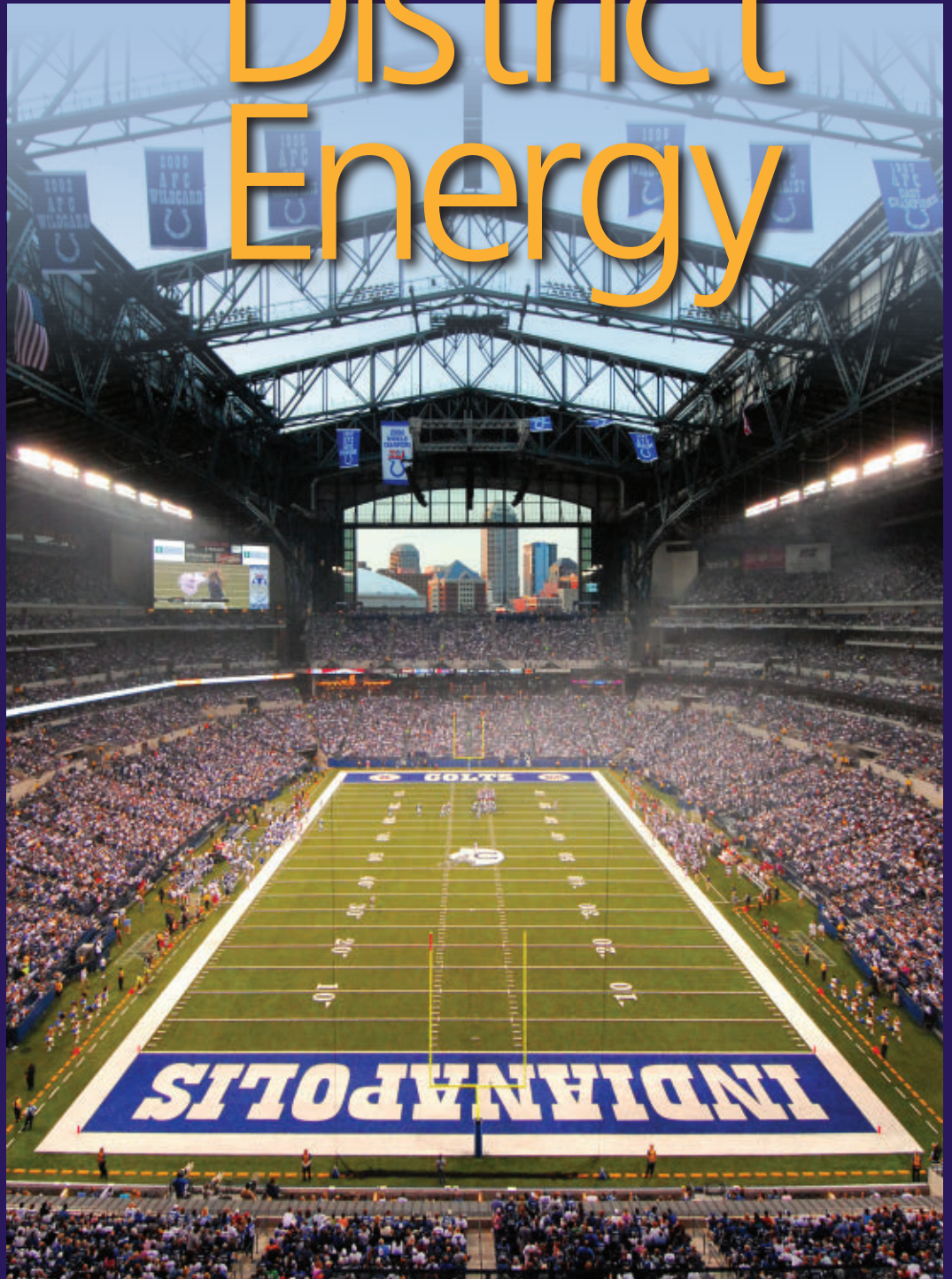
District Energy Expands
in China

"Super Boiler" Now Reality

Campus Conference
Retrospective

Sneak Peek at Upcoming
Annual Conference

and more...



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Plan Ahead for IDEA's Conferences



District Energy/CHP 2010:

101st Annual Conference & Trade Show

June 13 – 16, 2010

Westin Indianapolis and Indiana Convention Center

Indianapolis, Indiana

Hosted by Citizens Thermal

Fifth International District Cooling Conference

November 7 – 9, 2010

Doha, Qatar

Hosted by Qatar Cool

2010



24th Campus Energy Conference & Trade Show

February 22 – 25, 2011

Hyatt Regency Miami

Miami, Florida

Hosted by University of Miami and

The University of Miami Miller School of Medicine

District Energy/CHP 2011:

102nd Annual Conference & Trade Show

June 26 – 29, 2011

Westin Harbour Castle

Toronto, Ontario, Canada

Hosted by Enwave Energy Corp.

2011



District Energy/CHP 2012:

103rd Annual Conference & Trade Show

June 30 – July 3, 2012

Hyatt Regency Chicago

Chicago, Illinois

Hosted by Thermal Chicago

2012

**For more information visit: www.districtenergy.org/calendar.htm
or call +1 508-366-9339.**

District Energy

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Cover

18 Back to the Future: Old energy integrates with new in Indianapolis

David J. Toombs, General Manager, Citizens Thermal

Sometimes charting the best course for the future begins with a look at the past. Such is the experience of Citizens Thermal of Indianapolis, which recently went "back to basics" as it planned system improvements to maximize efficiency and customer service. After reviewing past operations, Citizens reinstated two former system features – condensate return and back-pressure turbines – that will help the company ensure its long-term success.

Features

9 Legacy Systems Present Challenges, Opportunities: TV II saw both in Detroit

Vic Koppang, President, Detroit Thermal

Thermal Ventures II is well-acquainted with the pros and cons of 'legacy' district energy systems. The company acquired and for 7 years has operated the system in Detroit, applying lessons learned in other cities. The century-old steam operation has been transformed with extensive upgrades that are paying off.

14 Managing Multiple Chilled-Water Plants: A promising new control strategy

Timothy M. Anderson, PE, LEED AP, Principal, Applied Engineering Services Inc.

Many district cooling systems have expanded using unmanned, remotely managed satellite plants. To maintain the pumping load balance between satellites and main plants, most systems use differential pressure control. But there is another option: pump control using a flow meter as the sensing input, a method working well in Indianapolis.

31 Del Monte's Super Boiler: Ultra-efficient unit bears fruit, reducing emissions

Robert P. Benz, PE, President, Benz Air Engineering Co. Inc.

The focus on energy savings and the environment has led to research and development of an ultra-efficient, ultra-low-emissions "Super Boiler" – originally just a concept of the U.S. Department of Energy. Del Monte Foods has brought the idea to life on the plant floor, creating an innovative boiler system that is a model for others.

35 A Pioneering Partnership in China: Foreign investment spurs district heating growth

Timothée Prenz, Project Officer, Dalkia Asia Pte. Ltd.

In cities across China, small coal-fired block "boiler houses" are the main heating source. While the government has long tried to encourage district heating development as a cleaner heating alternative, progress is finally being made as opportunities for foreign investment have opened up. Dalkia is a pioneer in the market, modernizing and expanding the system in Jiamusi.

ON THE COVER:

Lucas Oil Stadium, a Citizens Thermal customer, is home to the NFL's Indianapolis Colts. The building has a retractable roof and features spectacular views of the Indianapolis

skyline through the operable north window. It is connected to the newly expanded convention center and several hotels and was home to the NCAA Final Four in early April. Photo ©Bayanote Photography, Indianapolis.

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IDEA was founded in 1909. Its purpose is to foster the success of its members as leaders in providing reliable, economical, efficient and environmentally sound district energy services. The association's membership consists of representatives from utilities, municipalities, universities, hospitals, military bases, airports, industrial parks and other physical plant systems engaged in supplying thermal energy in the form of steam, hot water and/or chilled water for heating, cooling and process uses. It also represents engineers; architects; financial, legal, and management consultants; and manufacturers who supply services and equipment for community energy systems.

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Chair's Message



I am writing my last column as IDEA chair, and what a year it has been! It is hard to believe it has been nearly a year since we celebrated the association's 100th anniversary at the incredible National Building Museum in Washington, D.C. I will always remember that evening.

Seeing so many of you in the audience affirmed for me what a great association this is. Our business certainly is about systems, equipment, pipe and engineering – but it is nothing without people. I feel charged knowing that the talents, creativity, dedication and drive of our membership will take IDEA into the next 100 years and beyond. I also know that our members' projects and applications will continue advancing the cause of IDEA in a manner that benefits the environment.

We are starting to see traction among political decision makers and local leaders that energy efficiency is the low-hanging fruit when it comes to addressing climate change. Every day I see more and more media coverage indicating that energy efficiency has to be part of the solution. It parallels my career focus, which has always been increasing energy efficiency. It's what led me to my theme "Creating an Efficient Energy Future." We need to continue driving forward our message.

I have had the good fortune of working at one of the largest campus district energy systems in the U.S. We have been able to use technologies and strategies that have reduced our energy intensity, increased energy efficiency and reduced

carbon emissions. We have shown that energy efficiency pays dividends in savings, independent of the actual fuel cost. Sure, the more you pay for fuel, the higher the savings, but efficiency is a core principle we have believed in and continue to practice.

Efficiency never goes out of style. It may ebb and flow with the urgency of cost avoidance due to price variability, but efficiency is a constant. As a country, the U.S. needs to focus on efficiency. There is so much room for improvement, particularly on our campuses and in cities where the scale of systems provides return on investment.

Efficiency never goes out of style.

My colleagues at institutions like Princeton, Mizzou, Cornell and The University of North Carolina at Chapel Hill have implemented effective strategies to reduce energy intensity. Sometimes economic realities hamper efforts to increase energy efficiency. Sometimes we need capital to make operational improvements or modernize systems to meet load growth or new energy requirements. But no matter what the situation, we need to maintain the highest-possible level of reliability. As owners and operators of district energy systems for research campuses or in an urban setting, we have an obligation to ensure high-quality, uninterrupted energy is delivered.

The key to success in all of this is sharing information among ourselves and beyond, information from equipment vendors who are continually improving their capabilities; from peers with valuable experience and insight to share; and from consultants who can help make technologies and strategies easier to adapt, more cost-effective and ultimately more valuable to end-users. This information is available at IDEA. It is a nexus for sharing experience and information.

My term as IDEA chair has opened a world of opportunity to me – to share information and my experience in running large chiller plants with colleagues in the

United Arab Emirates and to visit world-class district energy systems in Denmark and see how our European colleagues are achieving ever-higher levels of energy efficiency, fuel flexibility and lower carbon solutions. We all face the common challenge of educating decision makers on the value of district energy and CHP.

The past year also has reinforced my belief that collaboration within our industry is important, including learning, sharing and working together to advance our systems' energy efficiency. IDEA has been a powerful professional resource for me. It also has helped our entire UT Austin team become better engineers, operators and stewards of our institution's assets.

As my term comes to a close, I extend my thanks to Monica Westerlund, who will be stepping down from her post as executive editor of *District Energy* magazine. She has served the organization for 20 years and been a constant creative voice for our industry. We wish her continued success.

I also am grateful to the dedicated and insightful board members who have served alongside me over the years. In particular we will sorely miss the experience and knowledge of outgoing board members Jim Adams, Cornell University; Gregg Coffin, University of Missouri in Columbia; Tim Merrill, NRG Energy Center Pittsburgh; Tom Pierson, TAS Packaged Central Plants; and Steve Tredinnick, Syska Hennessy Group.

I would be remiss if I failed to congratulate and thank Dennis Fotinos from Enwave for his enthusiastic leadership and commitment to IDEA for the past decade. Thank you! I will continue to serve as past chair and look forward to supporting Dave Toombs of Citizens Thermal as he takes the helm this June in Indianapolis.

My thanks to all of you for making the year a special one. Let us continue to work together to create an efficient energy future! 



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President's Message



Throughout the February fortnight of the 2010 Winter Olympics, my family was transfixed by the stories of achievement and perseverance unfolding from Vancouver. From the optimism of the opening ceremonies (tempered by the tragic loss of Georgian luger Nodar Kumaritashvili) to the congenial closing ceremonies, the Olympics showcased national pride and connected the global community. I congratulate my Canadian colleagues on their gold medal success, especially the hard-fought final in men's hockey.

District energy also played a key part in the success of these Olympics. Vancouver's mayor and city council recently inaugurated a new innovative district heating system using recovered heat to supply the new athletes Olympic Village. (The system was featured as the cover story of our third quarter 2008 issue of *District Energy* magazine.) The host city of Vancouver, easily one of the most naturally beautiful in North America, has had a successful privately owned downtown district heating system since 1968. Central Heat Distribution Ltd. serves more than 100 downtown buildings, including BC Place, the arena hosting the opening and closing ceremonies, and GM Place, the host hockey venue.

Judging Matters

With the Olympic torch now dimmed, I realize I prefer more empirical

contests than events based on subjective judging. I like the race against the clock in downhill skiing more than relying on the preferences of judges in pairs skating or half-pipe (even though the men's winner there was pretty clear). When outcomes may be 'prejudged' by prior standing, reputation, or worse yet, hidden alliances among judges, it not only diminishes the actual on-ice performance but calls into question the integrity of the sport. You might recall the 'Skategate' controversy of the 2002 Winter Olympics in which certain national judges were exposed for colluding to preserve status quo or exchange standings among medal contenders.

The same applies to competition in the energy and environmental policy arena. These days, with growing uncertainty about the path forward for federal climate and energy legislation, the quest for reasonable treatment for district energy/combined heat and power is at the top of IDEA's agenda.

Of course, in energy and environmental policy, as in sports, things are not always black and white. Referees, rulings and instant replay are needed from time to time. Policies and rules of engagement evolve over time as economic and environmental objectives shift, or as market conditions dictate. In the U.S., federal energy and climate policies are becoming more like an Olympic freestyle skiing event, which combines the empirical scoring of a frantic top-to-bottom mogul run with the subjective judging of artistic aerial flips based on height, degree of difficulty and execution of a clean landing. Today, in scoring an energy solution, an efficient run should be considered along with a clean start and a clean landing.

In energy and environmental policy, as in sports, things are not always black and white.

On the empirical side, carbon emission allowances can be estimated based on fuel types and historical annual fuel volumes consumed. From our view, a better measurement would be based on overall fuel efficiency or an output-based performance standard. Lower carbon fuels and more efficient delivery of power and heat, like better-conditioned or more highly skilled athletes, would therefore be favored in this segment. The second component of scoring, such as used to judge the aerial freestyle, could involve awarding allowances to classes of competitors based on subjective conditions such as regional displacement of emissions or to promote cleaner energy investments. In other words, the cleaner the energy source, the higher the score.

Staying in the Game

Like it or not, if we want district energy and CHP to remain a competitive option for campuses and communities, IDEA must stay in the game and work closely with congressional staff and agencies who are revising the rules on carbon emissions. As we go to press, the Senate is considering a revised approach from the economywide structure of the Waxman-Markey Bill that treats electric utilities separately from industry and transportation.

For instance, Sen. Lindsey Graham, R-S.C., has released a draft bill to create a federal "clean electricity standard." Under the bill, the government would distribute credits for clean energy generation and energy efficiency improvements. Utilities would be required to hold earned or purchased credits equivalent to an increasing percentage of their energy generation, beginning at 13 percent in 2012 and rising to 30 percent by 2030 and 50 percent by 2050. Coal plants that capture and sequester at least 65 percent of their greenhouse gas emissions and new nuclear plants would both qualify as clean energy sources. Utilities could use the energy efficiency credits to meet at most 25 percent of their compliance obligation. IDEA would like to see CHP expressly considered in this criterion.

It remains to be seen if the new Senate version will reflect a scaled-back approach on carbon emissions regulations, initially limited to electricity produc-

tion. Power plants would be subject to an emissions cap of increasing stringency, and industrial facilities might be exempt from the cap for several years. At a minimum, we would want the new rules to more fully reflect the fuel efficiency of district energy/CHP and not perversely threaten these assets with higher compliance costs than grid incumbents. We would like the downhill portion based on a minimum 62 percent CHP efficiency standard and the aerial freestyle scoring to recognize that emissions reductions occur when surplus heat is recovered and recycled for incremental use, displacing other fossil combustion and lowering regional emissions.

Part of our challenge is to educate more people involved in rule making of the positive solution that district energy and CHP can play near term in the United States. Immediacy must be considered in scoring, as neither nuclear nor carbon sequestration will be able to compete with CHP on 'speed to market.'

The Voice of the Competition

We need to recognize that, just as in the Olympics, there is spirited competition in this arena. The legislative committee of the American Public Power Association, an association of publicly owned electric utilities, approved a resolution recently on the contentious issue of how allowances should be allocated in a future cap-and-trade system. APPA's resolution stated that "all, or substantially all" allowances should be distributed among utilities on the basis of past GHG emissions.

We should not be surprised by the chorus of voices suggesting self-serving policy treatments, but we should likewise offer our own comments. Ultimately, one would hope that energy efficiency and environmental efficacy would trump political preferences and that competition between energy solutions would reasonably consider factors like true costs of capital, scarcity or availability of indigenous resources, fuel flexibility and other aspects of integrated resource planning. But all is not fair in love and politics.

Certainly, our university systems deserve credit for the regional emissions reductions achieved by their campus CHP to be properly scored against allowance requirements. The scorecard should not

be rigged for utility incumbents where free allowance allocations are given to dirtier utility operations on the margin just because of political clout or 'reputation.' Likewise, a district energy/CHP operator should not be disadvantaged by having to purchase emissions allowances to produce its own heat and power based on fuel consumption when the regional competitor, the incumbent electric utility, is granted dispensation with free allowances. That would be like asking district energy to ski the moguls without poles – a disastrous scenario.

At the same time, thermal-only district energy systems also want to be able to compete based on efficiency and environmental advantages. Electricity production should not be a prerequisite to qualify for renewable or advanced energy portfolio standards or production tax credits. If we recycle surplus heat or tap renewable sources of natural cooling to heat and cool buildings, we still displace combustion emissions. When heating or cooling is a principal need, policies should reward infrastructure investment like district energy systems.

Electricity production should not be a prerequisite to qualify for renewable or advanced energy portfolio standards or production tax credits.

U.S. district energy systems have largely flourished without external policy drivers or market incentives. Since 1990, nearly half a billion square feet of building owners have selected district energy service over installing on-site equipment based on competitive life-cycle costs and other advantages like simpler operations, reduced capital and operating risks, and the value of space recovered for more profitable uses.

On a community level, district energy systems have the advantage of economies of scale in tapping renewable resources and enhanced fuel flexibility, diminishing reliance on fossil fuels and improving the economic multiplier of indigenous resources like biomass or wood waste.

Who Should Be on Medal Stand

In the Olympics, fitness, performance and skill level should ultimately determine medal winners – not a referee's ruling. The ability of a district energy system to aggregate dozens or hundreds of buildings for thermal scale should yield operating efficiencies through load factor, industrial equipment efficiencies, allocation of fixed costs and pure operational advantage due to professional performance by skilled operators.

The quality, professionalism and training of operators, as evidenced by The University of Texas at Austin's 90 percent fuel-efficient CHP operations, should translate into lower operating costs and competitive advantages for end-user buildings. When it comes to evaluations of building performance, real-world performance metrics ideally would be properly factored and not arbitrarily impaired by assignment of LEED™ points or adjudged by source versus site emission disparities.

Policy drivers have clearly created favorable market conditions for renewables. Working with the U.S. Department of Energy's Clean Energy Regional Application Centers (DOE RAC), IDEA will support regional efforts to increase awareness of district energy and combined heat and power as a community level solution for enhanced energy security, emissions reductions and adaptive utilization of surplus heat and waste energy opportunities. The recent IDEA DOE RAC workshop in Reno was a positive first step, engaging more than 80 people in a discussion of technologies, applications and market strategies.

In addition, IDEA has established a relationship with the American Planning Association so that urban planners seeking more sustainable energy solutions are able to develop deeper insight on implementing district energy systems in their communities. We plan to explore community energy planning strategies at the upcoming IDEA 101st Annual Conference, June 13-16, 2010, in Indianapolis.

Looking ahead, it is pretty clear that competition for capital is becoming increasingly important for many of our

nation's institutions of higher learning. At IDEA's 23rd Annual Campus Energy Conference, hosted by the University of Nevada, Reno, it was abundantly clear that campus utility directors are not only being asked to implement more sustainable energy solutions to cut campus carbon footprints, but to do so with shrinking operating budgets and without readily available capital to update existing assets.

While many IDEA member universities continue aggressive efforts at higher efficiency, enhanced controls and tighter operational performance, there are an even larger number of institutions who are not members of IDEA, not participating in our conferences and may not be aware of the solutions undertaken successfully by IDEA peers. In other words,

they don't know what they don't know. There is huge pent-up demand to dramatically increase fuel efficiency across the country, and we need to reach this audience more effectively in the months and years ahead.

Ultimately, the race is not only to the swift, but also to the persistent.

Ultimately, the race is not only to the swift, but also to the persistent. IDEA will never have the resources to compete head to head with other industries, but we do have many advantages that support

our policy mission. We owe it to each other to continue our efforts to capture appropriations and to garner meaningful consideration in new climate regulations. Global competition in clean energy is definitely heating up, and we need to understand and influence the coming rules changes. If we want to be standing on the medal podium any time soon, we can't show up for the next hockey game holding only a curling broom. 



Robert P. Thornton
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To our readers,

With some sadness, I announce that this will be the last issue of *District Energy* magazine under the stewardship of our longtime Executive Editor Monica Westerlund. For nearly 20 years – the past 12 as executive editor – Monica has made an indelible imprint on the IDEA community through her deep commitment to technical and editorial integrity, her insightful attention to emerging issues and environmental trends, and her unbridled enthusiasm for capturing and communicating the quality work of the people of IDEA.

Ten years ago, IDEA magazine was often simply 40 pages of black-and-white technical case studies. Today, our full-color format *District Energy* magazine often exceeds 80 pages, provid-



ing consistent columns and engaging stories shared around the globe in print and digital formats. While I am saddened by the departure of such a talented and experienced colleague, I greatly appreciate her efforts in smoothly passing the editorial baton to highly capable Peter Myers, who produced our new industry video. She has been a tremendous resource and friend since we met nearly 25 years ago.

Monica plans to continue involvement in the district energy industry and looks forward to new-found opportunities. Please join me in congratulating and thanking Monica Westerlund for a 'job well done.'

Robert P. Thornton, Publisher

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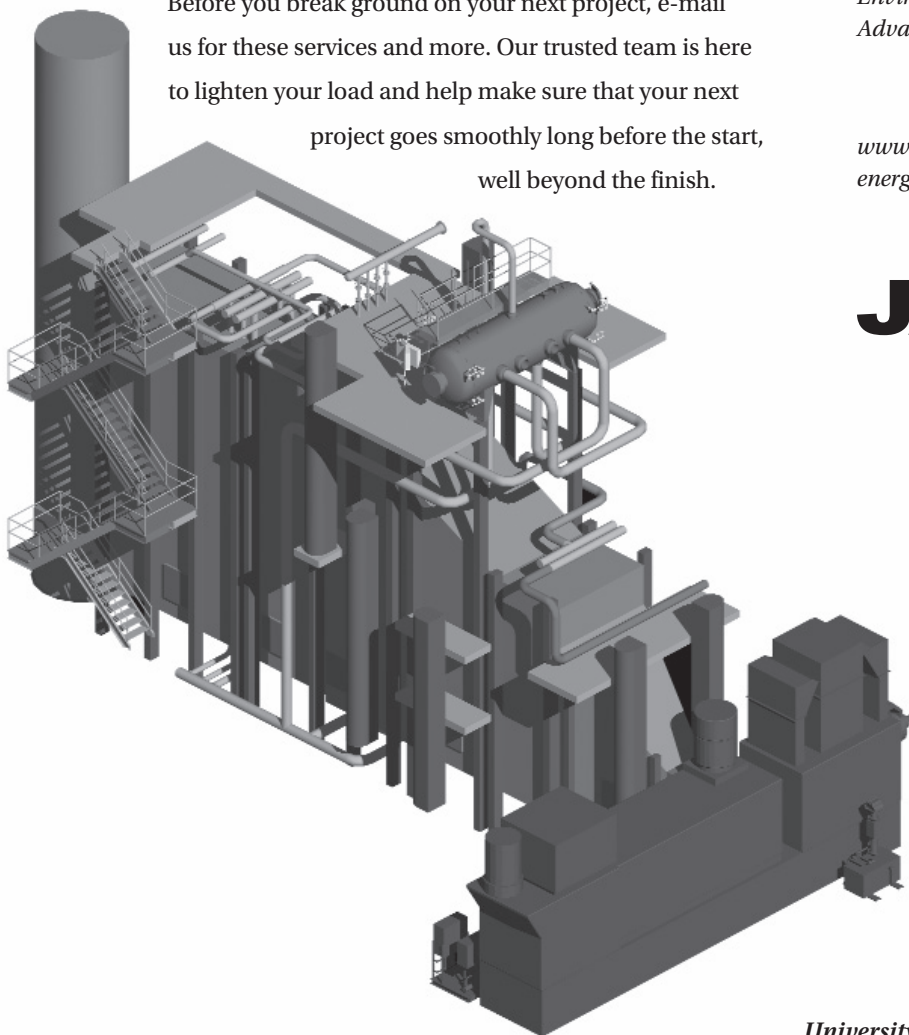
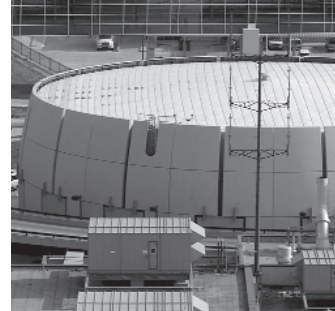
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Legacy Systems Present Challenges, Opportunities:

TV II saw both in Detroit

Vic Koppang, President, Detroit Thermal

“They just don’t make ‘em like they used to” goes the old saying – but this time it’s not the lament of an old-timer but rather the enthusiastic motto of those who see opportunity in legacy district energy systems.

It was certainly part of the complex evaluation conducted by Thermal Ventures II LP (TV II) when the Youngstown, Ohio-based company was considering taking over Detroit’s century-old steam system.

The Detroit system, one of the oldest and largest in North America, got its start as the Central Heating Company in 1903 – long before the city developed its manufacturing muscle, long before its growth into a major urban center and the auto capital of the world. As the city grew, so did the steam system. The primary boiler facility, known as the Beacon Street Plant, commissioned in 1926, is a National Historic Mechanical Engineering Landmark.

Today the system serves 144 buildings. It includes Beacon and two small boiler plants as well as 39 miles of distribution system, comprising 35 miles

of buried steam mains and four miles of tunnels below the downtown streets. The system has two operating pressures – 120 psig and 45 psig. It does not have a condensate return line.

History a Two-Edged Sword

“History is both a positive and a negative,” said Jeffrey Bees, chief executive officer of TV II, which bought the Detroit system from DTE Energy (formerly Detroit Edison) in 2003. “For example, on the positive side there’s an infrastructure and a customer base already in place. Equipment and infrastructure can be studied to determine if they offer opportunities for improving efficiency, and so can the customer base.”

Parts of Detroit’s infrastructure, such as the brick tunnels, are as structurally sound now as they were more than 100 years ago. They could not be installed at any price today.

“Old equipment, however, may not be as efficient as more modern versions, sometimes requiring extensive modification to benefit from today’s technology. The customer base is highly diverse in size, function and finan-

cial capabilities. And protocols and procedures may have become inflexible over time,” Bees continued.

TV II’s Unique Focus

Typically, legacy district energy systems were built in the early 1900s. The low-pressure exhaust steam created by electric generation was piped to district energy customers. Over the years the utilities developed business practices – operating protocols as well as ways of interacting with employees, customers, vendors, regulators and communities – that became ‘legacy practices.’

However, in contrast to electric utilities, TV II is entirely focused on acquiring, upgrading and operating district energy systems. The company, founded in 2000, purchased and operates the Youngstown, Ohio, system. It also operates private industrial steam plants at three General Motors facilities. TV II established a Michigan-based company, Detroit Thermal LLC, to own and operate the Detroit system.

“In every system we have been involved in we have found legacy practices that present opportunities for improvement,” Bees said.



Courtesy SMIC Photo LLC.

Courtesy SMIC Photo LLC.

TV II's experienced team of (left to right) Jeff Bees, Richard Pucak and Paul Razo carefully studied the Detroit system before deciding to acquire it. Bees, Pucak and Razo credit their experience at a variety of systems and their association with IDEA (all three are long-time members) with advancing their professional development. Pucak says IDEA distribution workshops and roundtable discussions have been especially helpful. Razo believes IDEA has helped him keep up-to-date on the latest technical innovations. "IDEA provides a wealth of information in its programming, but more than that it provides us with a network of people who face or have faced similar issues – people we can learn from in an informal way as well," Bees says.

TV II sent a team of experts, each of whom had extensive experience in legacy systems, to study the Detroit operation before the decision was made to buy it. "It was crucial to know as much as possible before we made our decision," Bees said. "We had to be confident that as a smaller, more nimble, more focused organization, we could run the system successfully. Because of our experience with other legacy systems, we knew what to look for."

Bees gained his experience, starting in 1985, as part of the Catalyst Thermal organization that acquired systems in Philadelphia, Boston, Baltimore, Cleveland, St. Louis and Youngstown. Other members of the TV II team also have extensive experience in evaluating and running legacy systems. Paul Razo, who is now distribution manager for Detroit Thermal, managed steam distribution systems in Boston, Cleveland, Youngstown, St. Louis and Akron. Richard Pucak, who currently serves as Detroit Thermal's director of operations and vice president of operations for TV II, gained his expertise at systems in Youngstown, St. Louis, Boston, Cleveland, Baltimore and Akron.

Applying Lessons Learned Elsewhere

Bees, Razo, Pucak and others brought the lessons learned in other cities to the due-diligence process that they applied to the potential purchase

of the Detroit system. They began studying the system a full year before the purchase was completed. They reviewed nondestructive testing that had been performed by DTE and undertook their own comprehensive inspection.

"We looked at everything we could – inspected the manholes, walked the tunnels – and then put our collective experience to work about what we couldn't see," Razo explained.

Pucak added, "We studied every aspect of the business: equipment, procedures, loads, staffing, labor markets and more."

They did extensive reviews of maintenance records to determine tube failure rates on boilers and to log reviews for utility consumptions and visual inspections of equipment. Interviews with employees were another an important source of information.

They also employed advanced technology to tell them more about the system. For example, aerial thermographic studies were done to reveal street-level temperature variances. Heat-balance analyses compared Btus going into the system as fuel, Btus being produced as steam and Btus being sold.

"Throughout the process, we were looking for what we view as opportunities," Bees said, "opportunities for improvements that would increase efficiency in production and reduce losses in distribution, while ensuring safety and reliability."

First Up: Capital Improvement Project

The "opportunities," as Bees calls them, led to an extensive wish list of system improvements. As soon as the change of ownership was completed, in January 2003, the newly formed Detroit Thermal LLC embarked on a \$34 million capital improvement program focused primarily on the distribution system. That, coupled with changes in procedures and personnel, had an **immediate** impact on the system.

As soon as the change of ownership was completed, the newly formed Detroit Thermal LLC embarked on a \$34 million capital improvement program.

"Although we came in expecting to make a huge capital investment in the long-term health of the system, we couldn't do everything we wanted to do at once," Razo said. The process of prioritizing was difficult, but it was guided by an overriding commitment to a simple formula: Safety first, reliability second, efficiency/economic value third.

"The projects we identified as immediately mandatory dealt with safety and reliability, and they were part of the negotiating process we went through with DTE Energy," Bees explained, adding that the utility was cooperative in incorporating deferred maintenance issues into talks between the two organizations.

As Razo applied the safety-reliability-efficiency paradigm to the distribution system, he initiated projects that ensure public and employee safety and looked at areas where the steam system might create maintenance issues for other utilities.

Attending to Practical Concerns

"The first things we spent money on were repairing leaks, insulating pipes and manholes and changing trap systems in manholes," he said.

Detroit Thermal replaced more than 75 percent of the traps in the first three years. Pipes in more than 300 manholes



A key component in Detroit Thermal's capital improvement project was the replacement of a huge old boiler with two smaller, much more efficient package boilers. The new boilers include state-of-the-art burners (pictured here). The new boilers use less fuel and reach full load more quickly than the boiler they replaced, thus improving efficiency and reliability. They also release fewer emissions.

were insulated with an innovative high-temperature foam that cuts down on radiant heat loss, and more than 31 manholes were completely rebuilt. In addition, the company changed to high-performance butterfly valves in main lines. Warmup lines were maintained where they already existed. Where there wasn't room for a warmup line, Razo's team standardized to gear boxes that require 32 full turns to be completely open, ensuring that the butterfly valves open slowly.

Parts of the system had to be isolated and shut down to accommodate the improvements; here, too, the good news/bad news of a long history played a role. The underground piping network had been installed in bits and pieces over time as the city grew and the demand for steam increased. The resulting network was a configuration of pipe loops and redundancies that allowed for one part of the system to be shut down while customers were served without interruption via another path.

On the operations side, Pucak's investment priorities included re-tubing a large boiler, demolishing a huge, inefficient boiler and replacing it with two smaller, more efficient models. The boilers are fueled by natural gas. Fuel oil may be used as backup. In addition to changing the boilers, the boiler operating controls were upgraded from old pneumatic

systems to state-of-the art computer-based systems.

Pucak also implemented different procedures for such frequent operations as banking the boilers and keeping them in hot standby.

Re-evaluating Old Procedures

"What we often find in legacy systems is that procedures that were instituted in an earlier era go on unquestioned," Pucak said, "but we are leaner, more flexible and so more willing to change and change quickly."

The experiences that Bees, Pucak and Razo have had at other legacy systems facilitated the application of best practices to the Detroit system.

"We have seen the various ways in which different companies address similar issues, and we can pull solutions from a variety of sources," Razo said. "Or we can construct a new solution combining pieces of what we've learned at other systems."

Management in Detroit Edison's Thermal Energy Division recognized the value that a focus on steam and experience with other steam systems could bring to the business. In a communication to customers before the sale, Edison explained: "Steam is not a core business for us. ... A dedicated steam company can provide more focus and better synergies."

That focus was viewed as a big advantage to the DTE Energy employees who chose to join the Detroit Thermal team.

Room for Some New Ideas

"It's hard to get a big utility to try something new, especially in what had become a very small part of their business," said Tom Munro, who started with Detroit Edison's Thermal Energy Division in 1976 and moved to Detroit Thermal as a distribution supervisor-project coordinator when the company was founded. Munro said he enjoyed his time at Detroit Edison and is glad he has been able to continue to work on the system under Detroit Thermal.

Munro made the transition with his own wish list of system improvements and is pleased he has been able to institute so many of his ideas.

"Here there is face-to-face contact with decision makers and an openness to try new things," Munro said. One of the changes Munro advocated involved more accurate metering. The conversion to flow meters has helped improve revenue.

Respect for Local Culture, Traditions

Detroit Thermal also studied areas of the convoluted piping system that were underutilized. It cost more to operate some lines, or some sections of lines, than customers could pay, but legacy systems have special relationships with the history and culture of their areas, and new owners have to be sensitive to the communities they serve.

For instance, Detroit Thermal found there was an old 1,300-ft low-pressure line serving just one customer, the Second Baptist Church. "The length of the pipe resulted in significant radiant heat loss. It was an expensive and inefficient situation," Razo explained.

But the church was dependent on the district heating system, and the building, including the basement, had played a significant role in the nation's history: Second Baptist was an important station on the Underground Railroad, the network of hiding places that helped fugitive slaves make their way north to freedom in the 19th century. In the church base-



Recent renovations to the control room make the room more comfortable and more practical. A special ergonomically designed desk accommodates the room's 10 computer screens as well as storage for charts, log books and other records.

ment, escaped slaves were hidden and given food, clothing and a place to rest before completing their long and dangerous journey by crossing the Detroit River to safety in Canada.

Detroit Thermal customer Second Baptist was an important station on the Underground Railroad.

Thus, ending service to Second Baptist was not an option – but neither was continuing to operate a money-losing line. After careful study, Detroit Thermal was able to run new pipe into the church off a high-pressure line about 60 ft away. The company also installed a pressure-regulating valve in an existing manhole and a long-distance pressure monitor at the Beacon Street Plant so engineers can track steam pressure at the church.

“A newer system would never have been configured that way,” Razo said, “but we worked out a way to close an inefficient line while being respectful of the building’s history.”

A Careful Bet Pays Off

Buying and operating legacy district heating systems offers a unique set of challenges, and given the size and age of the Detroit system, the challenges may have been greater than normal. However,

according to Bees, that's where there are also great opportunities.

“Going in, we recognize that there are risks,” he said. “There are things that we cannot know no matter how well we do our due diligence. But from a business perspective there are also great areas for efficiency improvement and business development.”

Detroit Thermal is taking a long-term view, and the extensive improvements are paying off. Recently, one of the system's largest customers, the Detroit Medical Center, signed a new, expanded 10-year contract.

“We have a great product. It may be old, but more important – it is safe, efficient, reliable, cost-effective and environmentally responsible,” Bees said. “We are going to continue to improve efficiency, continue to push for a larger customer base and continue to serve the city of Detroit.”



Detroit Thermal President **Vic Koppang** joined the company as general manager in 2008 and assumed his current title in 2009. He came to Detroit Thermal from Koppang Enterprises LLC, a business consulting firm he founded to help companies increase sales by focusing on customers' needs. Koppang's philosophy is consistent with that of Thermal Ventures II, which focuses on safety, reliability, efficiency and reassuring the market that Detroit Thermal is committed to long-term growth. Koppang may be reached at VKoppang@detroitthermal.com.

The Key to Success: Improving efficiency

When Detroit Thermal took over Detroit's district energy system, it hit the ground running.

“Improving efficiency is the key to running a successful legacy system,” said Jeffrey Bees, chief executive officer of TV II, Detroit Thermal's parent company.

An old boiler was replaced with two smaller, more efficient boilers. New valves were installed throughout the distribution system. Insulation was improved.

Other changes took less capital – but more creativity.

Chief Engineer Henri Onuigbo designed a system that uses condensate to warm the cold water that is fed into the boilers. The condensate forms in the 3-mile pipe that carries steam from the Greater Detroit Resource Recovery Authority facility to Detroit Thermal's Beacon Street heating plant. Previously, the condensate was cooled and discarded.

“We save energy by prewarming the feed water, and we save water, too,” Onuigbo explained. “Now we're getting value from what was before a wasted resource.”

Improvements such as these have allowed Detroit Thermal to control costs, and that in turn helps keep the tariff rate approved by the state fairly close to the Consumer Price Index. In fact, the tariff in early 2010, adjusted for inflation, was lower than in 2003, the year Detroit Thermal took over the system.



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Managing Multiple Chilled-Water Plants:

A promising new control strategy

Timothy M. Anderson, PE, LEED AP, Principal, Applied Engineering Services Inc.

As a district cooling system grows, the main operating plant eventually reaches its limit for expansion – possibly a pipeline limit or a real estate issue, and new generating capacity must be placed at another location to meet increasing demand. Managing the operational cost of a satellite plant often involves the decision to base operating personnel at one location (usually the original plant) and leave the satellite facility unmanned. A control system is installed in the satellite plant to manage operations, and the number of personnel with ‘hands on’ the equipment may be limited. For this scenario to be successful, however, the automated control of the pumping load balance between the main plant and the satellite plant must be reliable.

Typically this has been achieved with differential pressure control. An alternative has emerged, however: pump control using a flow meter as the sensing input. Although so far in limited use, this control method has proved successful in helping district cooling system operators at Citizens Thermal in Indianapolis, Ind., manage multiple chilled-water plants on a common piping grid.

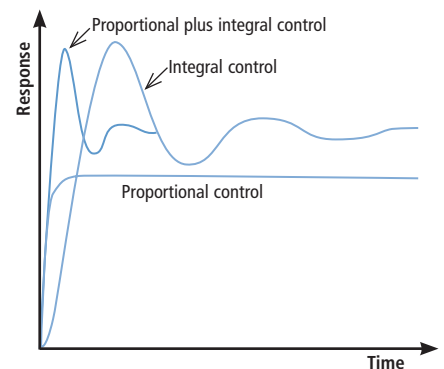
Chilled-Water System Evolution

The first chilled-water systems were simple in nature, consisting of a chiller

in line with a load, such as an air-handling unit with a circulating pump. The water circulation method was constant flow in a primary loop. Today, however, the industry has progressed to variable-speed drive pumping and multi-chiller installations with an emphasis on energy efficiency. The latest improvement in pumping efficiency takes out the common pipe and combines primary-secondary pumping into a single variable-speed primary pump. This reduces installation costs and cuts down on the energy wasted in the primary loop and common pipe.

The primary method of managing chilled-water circulating pump control is to use differential pressure control in combination with variable-speed drive technology on the pump to reduce the amount of energy consumed. A transmitter that measures the differential pressure is installed in a remote location on the chilled-water distribution system to read the difference between the chilled-water supply and the return pressure. The pump speed is adjusted to meet the pressure setting; increasing the pump speed will raise the differential pressure, and reducing the speed will lower the differential pressure. A time-response curve will look similar to figure 1 in its ability to produce stable differential pressure control.

Figure 1. Time-Response Curve. Response to a step change in setpoint with proportional, integral and proportional-plus-integral controllers.



Source: *Instrument Engineer's Handbook: Process Control and Optimization, Fourth Edition.*

The problem with this control method when applied to two chiller plants on the same system is the instantaneous nature of pressure feedback. When one pump senses a drop in the differential pressure, it will speed up to raise the differential pressure. When the second pump senses the increase in differential pressure, it will slow down to lower the differential pressure. If the time-pressure curves for both pumps line up on the apex, a potentially unstable control can develop. This is true even when there are two chilled-water plants located in separate areas.

To alleviate this problem, a second differential pressure transmitter can be used or additional dampening added to one of the pump control loops to reduce the potential for an unstable pressure control. However, the risk of developing unstable pressure control can only be reduced – it cannot be eliminated.

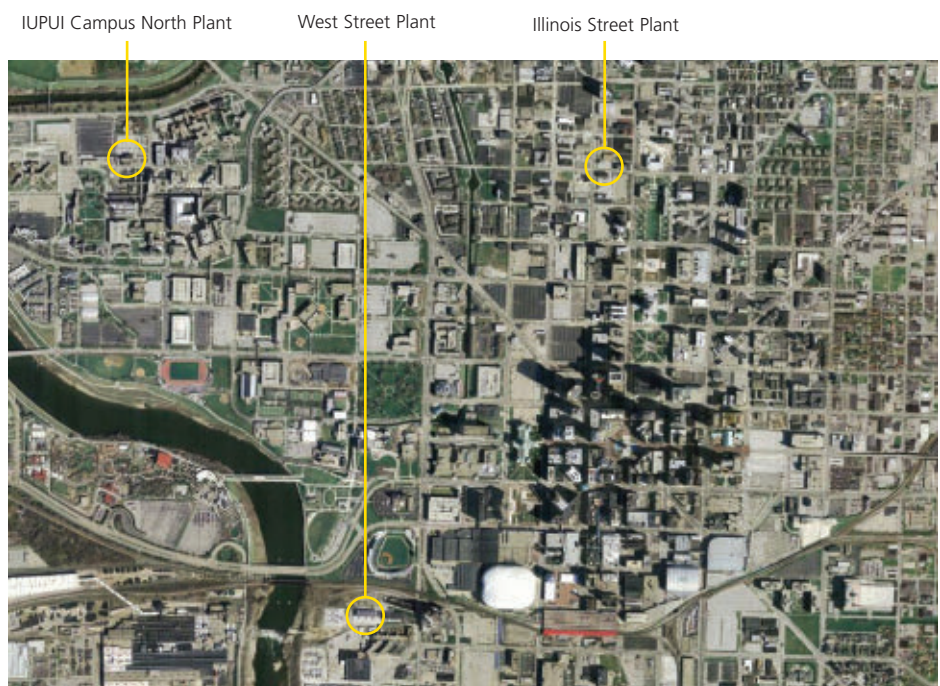
Different Approach Measures Flow Rate

Instead of using two differential pressure transmitters, a flow meter can be used as the second pump control input. The flow meter has the capability of measuring the output of one chiller plant and will not directly interfere with the pressure control of the other chiller plant. A flow meter that has no moving parts is preferred because it provides a smooth and steady signal. The pump speed control setpoint is a flow, and the signal from the flow meter is used to adjust the variable-speed drive to control the plant operating state. Pump staging can be accomplished independently by control algorithms that look at both pump speed and differential pressure.

The pump flow setpoint is a fixed value and does not respond to cooling load conditions. Therefore, it should always be used in unison with another chiller plant using the pressure control method. This type of setpoint control tends to load a chiller plant evenly with a given flow setting. The only load variable becomes the plant temperature rise, which can change throughout the day. Temperature rise is not as dramatic and can be reviewed more on an hourly basis to determine if a change is required.

There is an indirect pressure feedback that occurs between plants. The area of influence – the portion of the piping system served by the flow-controlled plant – changes with chilled-water system load dynamics even though the plant flow stays the same. This change in the flow-controlled plant's area of influence will cause the plant using differential pressure control to compensate. This type of dynamic load shifting will occur but the instantaneous pressure feedback is disconnected (it takes time for the flow sensor to register). The chiller plant operating on pressure control modulates

Figure 2. Three of Citizens Thermal's Chilled-Water Plant Locations.



to match the cooling load variations of the chilled-water system.

A plant operating on flow control must always operate in tandem with a plant using differential pressure control. Pump systems using flow as a control setpoint are maintaining a fixed flow value. The problem with this is that cooling load flows are always changing, so one plant has to be running on differential pressure control to handle the changes. A pressure control point should be installed in the chiller plant using flow meter control and should be used in the traditional pressure control approach as a backup control method. The chilled-water plant may have to be isolated at some point in time, forcing the plant using flow control to fall back on the differential pressure control method.

The flow meter control method can be utilized at multiple plants on the same system since the control sets a plant at a prescribed flow (or load) and operates with relative independence. A cooling system can potentially grow without limitations as plants and distribution are added.

The flow setting should always correspond to the number of chillers on line and the desired percentage of chiller loading. For example, a selection of three chillers operating at 60 percent load may

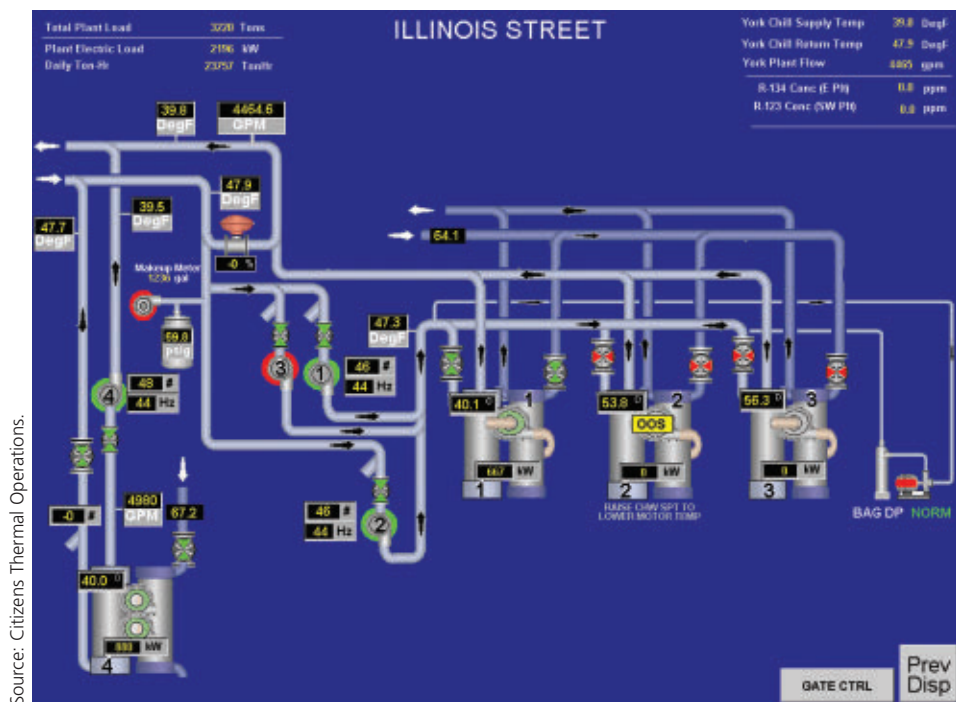
be more efficient than two chillers at 90 percent load. This selection process can be left to operations personnel with some experience operating the plant. For this reason, it is a good idea to install a bypass on an all-primary pumping system. The bypass can be controlled using a chiller differential setpoint that allows for a minimum circulation rate to pass through the chiller. When the cooling load drops off quickly, the bypass will keep the chillers on line, and the operators have a chance to react to changing conditions.

Flow Meter Control in Indianapolis

The Indianapolis, district cooling system has utilized the flow meter control method with success since 2005. This system is owned and operated by Citizens Thermal (Citizens), a member of Citizens Energy Group. (See the cover story in this issue for more on Citizens Thermal.)

Citizens' original chiller plant, the West Street Plant, first became operational in 1991 and has a nameplate capacity of 32,000 tons. It is located on the south side of the downtown area. The pumping system selected for this plant is primary-secondary and uses a combination of electric- and steam-drive secondary pumps. The West Street Plant operates on system

Figure 3. Control Overview Screen, Illinois Street Chilled Water Plant.



differential pressure control and is staffed with on-site operators 24 hours a day, seven days a week.

A West Street Plant expansion was completed in 2008, adding another 4,000 tons of capacity to the system serving downtown Indianapolis. Plus, Citizens has the ability to extend system capacity by another 4,400 tons by operating two customer plants. These plants are isolated from the central system when activated, freeing up plant capacity to serve other cooling loads. (Citizens owns and operates an additional 20,000-ton plant that serves one customer and is not connected to the downtown chilled-water system.)

Two satellite chiller plants are located approximately 2 miles to the northwest and northeast, respectively, of the West Street facility (fig. 2). The following additional chilled-water capacity is installed at these plants and available for dispatch:

- 5,500 tons at the North Plant on the Indiana University-Purdue University Indianapolis (IUPUI) campus
- 8,500 tons at Citizens' Illinois Street Chilled Water Plant

The IUPUI campus's North Plant is located on the northwest side of Citizens' distribution system. This is where Citizens first began using the pump flow

control method in 2005. A total of 5,500 tons of chiller capacity was installed, and the plant used a primary-secondary pumping system. A controls update in 2005 incorporated the flow control method to manage the secondary pump speed. The IUPUI chilled-water plant was located in a modified steam plant that was recently demolished. The old plant's chiller capacity was replaced with updated equipment and moved in 2007 to its current site near the old steam plant. The new chilled-water pumping system selected was primary-variable-speed-drive secondary, and a flow meter was installed on the plant supply line for use as a sensing input for pump speed control.

Citizens' Illinois Street Chilled Water Plant is located on the northeast side of the chilled-water distribution system and began using the flow control method in 2008. The original chillers (two at 2,000 tons) were installed in 2005 in an existing warehouse building on the site. An all-primary-variable-speed chilled-water pumping arrangement was used. Citizens determined that the plant should be operated in a manual mode, manually adjusting the variable-speed drive, due to an issue with the control system. With the most recent chiller installation in 2008, controls were updated throughout the Illinois Street

Plant so that all chillers now operate on the flow control principle (fig. 3). A differential pressure transmitter is installed on the furthest customer, and the plant can operate independently should a distribution separation occur.

As might be expected with a new control method, Citizens experienced a learning curve when implementing flow meter control. According to Joe Ray, senior operator for Citizens Thermal, however, "The flow meter control method works very well. Citizens has spent time to train the operators on how to set the flow control and has developed enough confidence to start chillers remotely. Investment in a reliable control system and some cameras to get a remote view of the chiller assisted greatly in transitioning to a remote chiller start."

Ray adds that "chiller dispatching decisions are made at the operator level with some guidance on which is the most efficient chiller to start." Operators are constantly looking at the combination of cooling load and chillers operating, looking for a point where the match of load-to-chillers will be more efficient. This is a typical occurrence when the cooling load is dropping and chiller loading is at 40 percent or below.

As the Citizens Thermal experience shows, the flow meter pump control method is a reliable remote plant control option. Operators have become so experienced in implementing this control strategy that they use it to start equipment remotely, saving time. In addition, this strategy allows operators time to make energy-conscious decisions regarding equipment to improve chiller plant operation. 



Timothy M. Anderson, PE, LEED AP, principal at Applied Engineering Services Inc., has been a design consultant for 16 years. His engineering background includes district chilled water and steam generation, refrigeration and HVAC. A registered professional engineer in Indiana and Ohio, he previously served as the director of engineering at the Cleveland district energy system. Anderson graduated from Purdue University with a bachelor's degree in mechanical engineering. Anderson may be reached at tanderson@applied-e-s.com.

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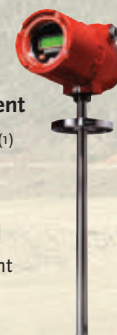


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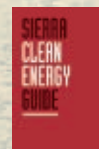
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⁽¹⁾ 2009 Flow Research Study, Yoder

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BACK TO THE FUTURE:

Old energy integrates with new in Indianapolis

David J. Toombs, General Manager, Citizens Thermal

Editor's Note: Citizens Thermal is serving as host for IDEA's 101st Annual Conference & Trade Show to be held in Indianapolis, Ind., June 13-16, 2010. The conference will include a tour of Citizens Thermal facilities.

In reviewing the current state of district energy, and considering where we hope to be in the future, we should reflect on the past – or as some might say, go “back to basics.” To me, the basics are the energy efficiency and operational specifications that were originally designed into our existing systems. Those systems may not have been installed with the automation and/or controls to fine-tune equipment as we do today, but the basic district energy technology and applications are the same ones we work with now.

So why has district energy been around for more than 100 years? Because it supplies an efficient, necessary energy source and delivers quality customer service at a competitive price. Looking back to basics on a regular basis can help us continue to operate efficiently, provide good service and be more cost-effective for our customers.

At Citizens Thermal in Indianapolis, Ind., we have been reviewing the basics of our district energy system and have found a few opportunities for improvement. Taking a look at our past operations, we recently reinstituted a couple of former

system features – condensate return and back-pressure turbines – as improvements that will help us ensure a successful future.

Condensate Return Again Feasible

Citizens' original condensate system, which dated to the 1920s, was shut down and abandoned in the 1980s due to its poor condition. For the next couple of decades, we no longer received condensate return from any of our customers. But when the Lucas Oil Stadium was being built and the Indiana Convention Center was being expanded – both close to our Perry K Steam Plant – we investigated installing a new condensate return system for these steam and chilled-water customers. We had to determine if it was feasible from an economic as well as a construction standpoint.

As most of us know, the lack of tunnels in all kinds of existing thermal systems means it is not always economically viable to reinstate old condensate return systems. The chemical composition of pipe and the low pH of the condensate combine



Courtesy Citizens Thermal. Photo Mike Powell, Citizens Energy Group.

The close proximity of the Perry K Steam Plant to the new Lucas Oil Stadium, home of the Indianapolis Colts, helped make condensate return a viable option.

to cause a number of leaks that, in a downtown area such as ours, become extremely expensive to replace or repair. In Indianapolis, therefore, these old return lines were not considered an option.

A number of systems use amines or similar products to chemically treat the steam, thereby protecting the condensate return system. Even this, however, can cause problems with coverage, depending on whether there are pressure-reducing valves in the system, the overall size of the system and so on. Technically speaking, there is a delicate balance between types and kinds of amines and the distribution ratio (liquid-to-vapor) that directly affects a system that has PRV stations. (If you have questions concerning amines, consult your water treatment professional.)

We currently do not use amines or similar chemicals because several of our large customers use our steam in direct contact with food or in processes that might adversely affect their U.S. Food and Drug Administration-regulated control environment. We realize there are chemicals that meet the



Courtesy Citizens Thermal Engineering Group

Citizens' new condensate line from the convention center lies on top of the fill covering new chilled-water lines. Here workers install electrical and communications ductwork.

food regulations requirements, but our customers have requested that we not use them at this time.

In the past, when energy was more affordable, priorities other than condensate return installation or treatment absorbed our budget dollars. Some of those priorities were related to emerging technologies, federal and state emission controls requirements, carbon credits related to climate change, permits, labor agreements and more. Even when we felt dollars should be invested in condensate return or other potential improvements, our investment managers would question spending money on those projects due to a low return on investment – especially when energy was very inexpensive. Today we are not only more conscious of the cost of energy and our obligation not only to our current customers, but also to the impact of our decisions on future customers and our environment. It's not that cost is not important; it is. It's just that we look for different types of solutions using a different set of eyes and/or approach than we used years ago.

Ultimately our investigation indicated we should proceed with installation of a condensate return from our new customers, Lucas Oil Stadium and the expanded Indiana Convention Center, and size the line for future growth as well. The center was already connected to our system, so it was a matter of incorporating the changes made to the center during its redesign phase. The new stadium required new engineering to complete its connections for service and condensate return.

The new condensate return system was installed at the same time as the new chilled-water and steam service lines, thereby saving installation dollars. This enabled us to offer



Courtesy Citizens Thermal Engineering Group.

The Perry K Steam Plant houses the condensate receiver and pumpout units for the condensate returning from the Lucas Oil Stadium, convention center expansion and other future customers.

the stadium and convention center up to 5 percent off their existing steam bill – a discount that has been available in our rate structure for many years but was not until recently in use due to the lack of any condensate return system. (In the future, other customers may also be able to take advantage of this discount if we and they develop an economically sound plan to install a return line or system from their buildings back to Perry K. Customers who are very close to this new system will be able to connect as long as the cost is right for both of us.)

Since we do not inject amines, we needed to ensure that the pH of the condensate would not erode or corrode the new condensate system piping. In reviewing different types of piping for condensate, it was noted immediately that we had to keep the temperature of the returning condensate below 200 degrees F in order to use a pipe that had a resistance to low pH for long-term use. The pipe we chose was a preinsulated PEX and polyethylene with an oxygen diffusion barrier rated at 204 F. Our specifications for the customers are that the condensate needs to be returned at temperatures between 140 F and 200 F. In addition there are some specifications related to the conductivity of the condensate to ensure water quality.

At the same time, we decided not to allow traps from the distribution system to discharge directly into the condensate return system. At our Perry K Steam Plant, we installed a condensate receiver tank complete with pumpout units to return the condensate into the Perry K system.

We hope that we will eventually be able to connect other existing and new customers to the system. We know that expansion of the condensate system is not possible in many areas, but our goal is to install a system that is reasonable in cost and at the same time benefits our customers. So far, our efforts are succeeding: Ever since the condensate return system has been in place, Lucas Oil Stadium and the Indiana Convention Center have seen both energy and cost savings. From October 2008 through December 2009, they purchased 102,200 Mlb of steam and returned 8.28 million gal (68,800 Mlb) of condensate back to Perry K. The amount

Citizens Thermal’s Downtown Systems

	Steam System	Chilled-Water System
Number of Customers	230	57
Number of Buildings Served	278	130
Central Plant	Perry K	West Street
Central Plant Capacity	2,000,000 lb/hr	36,000 tons
Satellite Plant Capacity	N/A	38,000 tons (four satellite plants)
Number of Boilers/Chillers	8	27 (central plant plus satellite plants)
Energy Sales	7,449,907 MMBtu	151,000 ton-hr total from all plants
Fuel Types	Coal, natural gas and steam from Covanta waste-to-energy plant	Steam and electric
Length of Distribution Network	27 miles total piping	15 miles trench ft
Piping Diameter Range	1 to 30 inches	2 to 48 inches
Steam Pressure	600, 400, 250, 15 psig	400 psig
Supply Temperature	N/A	40 F
Return Temperature	N/A	52 F
System Water Volume	N/A	15,000,000 gal

Source: Citizens Thermal.

of condensate returned represents an average of 67.3 percent with a generated bill credit of \$34,654. Additionally, the amount returned represents a savings of 7,868 MMBtu (78.7 ktherms) of fuel. (The energy savings rate is based on average difference between heat energy received from condensate less heat energy available from regular source water.)

Ever since the condensate return system has been in place, the stadium and convention center have seen both energy and cost savings.

The water, chemicals and energy savings made possible by our new condensate return system make this statement a correct one: “Sometimes the old way is the right choice, even today.”

Reinstallation of Back-Pressure Turbines

As Citizens saw with its ‘return to condensate return,’ the basic processes of district energy dating back to its modest beginnings are still relevant today. Many of our current district energy systems were founded to utilize the byproduct of providing electricity to customers. Generated steam was often considered waste until it was captured for heating or process load, which still holds true for many new engineering designs today.

In the past few years, we have been hearing more and more about efficiency, sustainability (“meeting the needs of the present without compromising the ability of future generations to meet their own needs”) and cogeneration – the simultaneous production of electricity and mechanical power from a single heat source (using the steam twice). The term “cogeneration” today is usually used to refer to combined heat and power.

The mechanical power portion of the cogeneration equation is sometimes forgotten. A large number of IDEA members and industrial users have boilers that provide steam for heating or processing. The steam also generates energy through small turbines that are used to drive equipment. This process happens prior to the steam moving into the distribution system. This type of turbine is often referred to as a “back-pressure turbine.” The back pressure goes to either a deaerator tank for heating purposes and O₂ removal or to the steam distribution system as a salable or usable product. This same type of cogeneration can be used to drive pumps, fans, compressors or other pieces of equipment required to run integrated systems.

Taking care of basics ties in here, as that may include using a blowdown heat exchanger to recover the heat going



Courtesy Citizens Thermal Engineering Group

Two 1.7 MW back-pressure turbines take 600 psig steam and reduce it to 250 psig, which provides cogeneration and sustainability, improving the efficiency of the steam produced.

to waste from the boiler blowdown or other areas, for example. Other basic improvement measures may involve managing water treatment to remove both scale inside tubes, cleaning soot and ash from the outside of tubes, reviewing oxygen settings for efficient combustion, providing adequate insulation of piping and equipment, or reviewing the heat balance of your plant and total system in light of changes in operation or equipment over the years.

This leads us to our second project – installing two back-pressure turbines to produce 1.7 MW (cogeneration) each, instead of utilizing a PRV. It is another instance of looking back to the system basics of the past to improve our operations for the future.

In 2007 and 2008, as Citizens investigated system data from the past, we noted that our system used to have a back-pressure turbine rated at 11 MW. It had been installed in 1936 and removed during the 1980s. This back-pressure turbine was used to take 600 psig steam and reduce the steam to 250 psig.

In its place is a full set of PRVs that was installed to provide 250 psig steam to the distribution system. With our cost of electricity increasing over the years and our escalating electrical load, we needed to install approximately 3-4 MW of additional generating capacity to meet our existing peak electrical load. We have an existing 5 MW turbine that supplies power on our side of the meter. But during outages or required maintenance to this unit, we would set a new demand, which involved a ratchet that required us to live with the additional electric cost for the next 11 months.

With an understanding of our history, we began investigating how we could lower our electrical cost and improve

overall plant efficiency. We started reviewing both our load profile from the electric side and our steam load profile going to our customers through the PRVs. With these numbers, it was easy to determine that installing two back-pressure turbines was the right thing to do, not only in terms of plant efficiency but also in savings on electrical costs.

Reviewing the numbers, it was easy to determine that installing two new back-pressure turbines was the right thing to do.

We still have a long way to go to make sure our plant efficiency is the best it can be. Our goal is to deliver quality service and, at the same time, introduce an additional service – i.e., condensate return – to our existing and new customers close to Perry K, which in turn saves them money.

Our mission at Citizens is to provide safe, reliable energy services to our customers while being good stewards of the environment; maintain the lowest possible rates with sound financial management; build and renew our businesses to remain competitive; add value; and create the greatest long-term benefit for our customers and communities. As we all know, district energy provides environmental and efficiency advantages over operating and maintaining individual facilities. Then, to maintain a position that makes district energy the customer's preferred option for providing energy, we must make sure to remember the basics that brought us where we are today.

I challenge you to ask yourself: What can you do to improve your system by reviewing your past? 🌀



David J. Toombs is general manager of Citizens Thermal, a division of Citizens Energy Group, which owns and operates the district steam and chilled-water systems in downtown Indianapolis. Responsible for the administrative, operations and maintenance aspects of the steam business, Toombs also evaluates and oversees strategic growth opportunities for both Citizens Energy Group and Citizens Thermal. He joined Citizens Thermal in 2000 following its acquisition of the district energy assets from the local investor-owned utility. Previously he was involved in the acquisition and management of district energy systems in Nashville, Tenn.; Cleveland, Youngstown and Akron, Ohio; Baltimore; Philadelphia; Boston; Pittsburgh; San Francisco; and St. Louis. He is currently vice chair of IDEA's board of directors, slated to become chair for 2010-2011. Toombs may be reached at DToombs@citizensenergygroup.com.



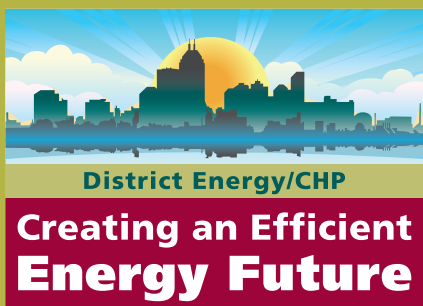
Start Your Engines! Indianapolis great site for annual conference

Citizens Thermal and Citizens Energy Group look forward to hosting IDEA's 101st Annual Conference & Trade Show. It is our hope that you and your associates, customers and families will come and enjoy Indianapolis, known as "the crossroads of America."

Perhaps you know our city best for the Indy 500 car race. But if you have not been here for some time, or if it's your first visit, you will see a growing city with a hometown feel that offers many attractions within walking distance of the conference location, The Westin Indianapolis.

There is our Central Canal with its shops, restaurants and paddleboats. Our city boasts more than 20 museums – something for every interest. The downtown Circle Center mall offers all your favorite stores. You can stroll to the Indiana State Museum and the Eiteljorg Museum, considered one of the best American Indian and Western art museums in the country. For families (or the kid in you), the Indianapolis Zoo, just west of downtown, and the Children's Museum, about 3 miles north of downtown, also need to be on your activities list. And, as in district energy, sometimes the old is better than the new – especially when it comes to a romantic ride in a horse-drawn carriage with your significant other.

All this and more awaits you in Indianapolis!



District Energy/CHP 2010: IDEA's 101st Annual Conference & Trade Show June 13-16, 2010

Westin Indianapolis and The Indiana Convention Center • Indianapolis, Indiana

CONFERENCE PREVIEW



Now more than ever, efficient use of energy has global economic and environmental importance. Since its founding in 1909, IDEA has been committed to advancing an efficient energy future through implementation and optimization of district energy and combined heat and power.

Today, IDEA members from around the world are converging on the simple fact that district energy systems enable communities to achieve higher energy efficiency with greater flexibility and lower CO₂ emissions from cleaner, indigenous energy resources. With global population moving to denser, urban settings, district energy infrastructure is an essential component in planning for a more sustainable energy future.

IDEA's 101st Annual Conference & Trade Show will feature industry thought leaders and practitioners, timely recognition and awards, compelling keynote speakers, high-quality technical content and invaluable peer networking.

Join us June 13-16, 2010 to

- hear public and private global industry participants explain how District Energy/CHP is a first tier economic development strategy;
- listen to policy experts share current insights on the impact of pending energy and climate legislation;
- engage with senior industry executives who drive infrastructure investment decisions; and
- connect with global resources, equipment suppliers and service providers who are designing and building world-class district energy systems.

In addition, panel discussions will feature insights from leading industry voices who are driving policy discussions, development trends and forging a robust future for district energy.



**For more information
or to register visit**
www.districtenergy.org/calendar





Plenary Level Panel Discussions

Sustainable Global Cities – Major Urban Centers Look to District Energy Infrastructure
Seoul, Copenhagen, London, Stockholm, Berlin, Paris and others discuss district energy as an essential building block to an efficient, environmentally responsive energy future in a growing metropolitan market.

Large Scale District Cooling Systems – Optimizing a Smarter Grid
Diverting demand from the wires to chilled water produces profound benefits for customers, companies and communities. Featuring exceptional cases in Toronto, Chicago, Doha, Princeton and others...

District Heating – Enabling Fuel Flexibility and Enhancing Energy Security
Aggregating community heating loads creates economies of scale for robust heating options to leverage surplus heat from power plants, energy from waste and biomass, coal conversion and other local energy resources.

District Energy Goes to College
Facing intense stakeholder pressure to mitigate carbon emissions, IDEA's leading campus systems share a page from their playbooks on achieving world-class energy efficiency and cutting edge climate action plans while supporting big-time, mission-critical customer growth.

Industry Workshops Focused on Business Development

District Energy and LEED: A progress report and detailed update on how district thermal energy is to be treated in newly revised LEED Guidance.

Government Buildings on District Energy: A focused discussion on working with GSA, FEMP and other government agencies to retain and grow customer relationships for district energy providers.

Community Development Around District Energy: How to integrate energy planning and district energy infrastructure for a more sustainable, livable and economically competitive community.

Partial List of Planned Technical Program Proceedings

- **Case Studies, Master Planning, System Development & Renewal**
 - Integration Between District Heating and Real Estate; Business Plan for the District Heating Utility
 - Energy Outsourcing – Innovative Approach to a Public-Public-Partnership: Gainesville Regional Utilities (GRU) and Shands Healthcare
 - The Energy Combinate of the Region in Östergötland, Sweden
 - Parkland Replacement Hospital Central Utility Plant Goes Green
- **Combined Heat and Power/Cogeneration**
 - Quantifying the Financial Benefits of a New Combined Heat & Power Plant System in a Carbon Constrained World
 - Cogeneration at a Small District Heating Network, Real Case
- **Renewable Energy Applications**
 - Geothermal Systems on a Campus Scale Ball State University's Journey from Stokers to Circulating Fluidized Bed to Geothermal
 - Innovative Green Project to Convert a Downtown Energy System into a Very Large Baseload, Biomass Clean Energy Facility
- **LEED Buildings and Sustainable Communities**
 - Beyond LEED, The Road to Net Zero Energy Buildings: What To Ask of Your Architects & Engineers
 - Regent Park Central Energy System in Toronto, Opportunities and Challenges for Heating, Cooling and Cogeneration
- **Biofuels and Fuel Flexibility**
 - Nano-Enzymes Improve Coal Combustion
 - Advanced Biofuels for Power Generation
 - Organic Rankine Cycle Technology in Biomass Fueled CHP District Energy: Success in Europe and Opportunities in North America
- **Managing Loads, System Optimization & Efficiency**
 - 12 Step Retro-Commissioning Process to Maximize Asset Utilization, Save Energy, and Save Money on Demand Charges
 - Unconventional Strategies for Growing District Heat Networks
 - Utilization of Modeling Software to Economically Optimize Energy Plant Operations
- **Mission Critical Cooling for Data Centers, Airports, Medical Centers**
 - Green Methods to Prevent Chilled Water Loop Problems
 - Innovative Water Reuse: Sustainable Water Management and Conservation Using Advanced Cooling Technologies
 - 27 MW Industrial Cooling Applications Based on Energy Efficient Vacuum Icemaker

■ Cooling and Thermal Energy Storage

- Energy Efficiency Issues of Cool Thermal Energy Storage
- Turbine Inlet Cooling: Energy Efficiency & Carbon Footprint Aspects for District Energy
- Elements to be Considered to Evaluate Chiller Plant Efficiency in Different Climates
- Thermal Energy Storage at Texas Medical Center
- Underground Thermal Energy Storage (UTES) Integration with District Energy Systems and the European Perspective
- Thermal Energy Storage – From Power Poles to Politics: The Value of These Big Chilled Water “Batteries”

■ Controls, Monitoring & Metering

- University & District Energy Case Studies – Improving Flowmeter Performance & Turndown in Steam Applications
- Practical Use of Real Time Hydraulic Modeling In Day-to-Day System Operation and Optimization – Case Examples From Utilities in the US and Around the World
- Michigan State University – Centralized Monitoring of CHP Plants Using Advanced Pattern Recognition Software

■ Operations, Maintenance, Safety, Training and Development

- Development and Implementation of a New Steam Emergency Response Plan and Overview of the 2007 Incident in New York City
- Extending the Useful Life of Underground Utilities with Cathodic Protection
- Industrial Waste Heat Recovery Facilitated with Spider Plow District Installation
- Best Performance Standards Boiler: Efficiency/Emissions Assurance
- Fuel Supply Diversity Ahead of the Meter – Equally Important For Diversity Behind Meter – Case Studies
- Emissions Compliance: Case Study of Front End Planning in the Context Of The New EPA Boiler MACT Standard
- Manhole Design for Optimal Safety and Performance
- Prioritizing Infrastructure Piping Inspections
- Removal of Condensate from Steam Systems
- BIM & GIS: Leveraging BIM Data for O&M



Applaud and Recognize Leadership and Industry Achievements

In 2010, IDEA will once again recognize industry excellence in our annual presentation of the System of the Year Award, the Norm Taylor Award and industry growth through the District Energy Space Awards.



Recharge with Colleagues and Friends

Last year, over 700 people from around the world attended the IDEA Annual Conference and Trade Show to reconnect with colleagues and friends and to meet new friends and form new partnerships. From the opening annual golf tournament on June 13 to the closing technical tour of Citizens Thermal on June 16, there will be multiple luncheons, refreshment networking breaks and hosted receptions in between. Peer achievements and excellence are recognized at the luncheons and the annual chairman's banquet. A spouse and guest program offers several opportunities to see the local sights and meet people from around the world.

Network with Key Suppliers and Innovators

Ninety exhibit booths will feature over 80 IDEA Business Partners exhibiting their product offerings and innovations. Under one roof, attendees can visit with tremendous technical and business resources in a marketplace of ideas and solutions, focused on the unique needs of the district energy community. Only a few exhibit spaces remain available as of March 21, 2010. **If you are interested in exhibiting or in sponsoring an event, contact Tanya Kozel at (410) 518-6676 or tanya.idea@districtenergy.org.**

For more information or to register visit www.districtenergy.org/calendar.

Registration Fees

(Fees are in US dollars)

	On or Before May 21	After May 21
IDEA Members	\$995	\$1,095
Non-Members	\$1,395	\$1,495
Government/Military (must have ID)	\$595	\$695
Spouse/Guest (no technical program)	\$425	\$425
One Day Only - Member	\$595	\$695
One Day Only - Non-Member	\$750	\$850

Annual Golf Tournament

Sunday, June 13
7:00 am – 2:00 pm

Join us on Sunday, June 13, 2010, for our Annual Golf Tournament at Brickyard Crossing Golf Resort, re-designed by the legendary Pete Dye in 1992-1993. This course is one of the top public courses in America. It provides the unique experience of playing four holes inside the legendary oval of the famous Indianapolis Motor Speedway. The course hosted the PGA Champions Tour Comfort Classic for 7 years from 1994-2000 and the PGA Tour event from 1960-1968.

\$180 per person includes transportation, breakfast, lunch, cart and green fees, driving range and shotgun start.



Technical Tour

Wednesday, June 16

The technical tour for this year's Annual Conference will include visits to Citizens' Perry K Steam and West Street Chilled Water plant facilities.

First built in 1893, Citizens Thermal's Perry K steam plant was originally constructed to provide electricity and low-pressure steam to downtown Indianapolis. Although the plant has changed over the years to keep pace with the changing energy demands of a growing city, it operates today with 8 boilers with a combined steam capacity of nearly 2.0 million pounds per hour, and it supplies a steam system that delivers nearly 7.5 billion pounds of steam annually.

Citizens' West Street Chilled Water plant is a major customer of the Perry K steam plant. Constructed in 1991, the plant utilizes 400 psig steam to power six 5,000-ton centrifugal chillers. Today, with a capacity of 36,500 tons, this plant is the largest of 5 interconnected plants which provide over 54,000 tons of district cooling to downtown Indianapolis.

Technical tour participants will have an opportunity to see how the long-term results of steam plant modifications and chilled water plant construction have combined to allow Citizens to provide low-cost district energy to a wide variety of commercial, institutional, and manufacturing interests.



For more information or to register visit www.districtenergy.org/calendar.

Spouse and Guest Activities

The following events are included with a spouse/guest registration. Event tickets for children may be purchased individually during the registration process.

Tour of Indianapolis

Sunday, June 13, 2010

11:45 am – 3:30 pm

The tour includes transportation and admission to the Hall of Fame Museum at the world famous Indianapolis Motor Speedway. Since 1911, the Speedway has been home to the "Greatest Spectacle in Racing," the Indianapolis 500. Experience the history and thrill of auto racing with a visit to the Hall of Fame Museum and lap around the famed 2.5-mile oval track (track lap subject to availability). Guests will get a sneak peak at other well-known Indianapolis landmarks, such as the Soldiers and Sailors Monument, Conseco Fieldhouse, and Victory Field.



Brown County Tour

Monday, June 14, 2010

9:00 am – 3:00 pm



Nestled in the hills of the southern part of the state, lies the quaint village of Nashville, Indiana. This is a natural haven for artists and visitors alike featuring 250 shops. Brown County offers the finest in handmade, one-of-a-kind items, distinctive oil paintings, designer jewelry, antiques, candles, and more. While exploring Brown County, you may enjoy lunch (on your own) with the finest Midwest home-cooking and settle back and enjoy the natural beauty of the scenic back roads, quaint country lanes, rustic log cabins and breathtaking vistas. After a few hours of

shopping, we will take a short drive to Oliver Winery. Established in 1982 and tucked away on 15 acres which surround a lake, this scenic winery stop will allow you an opportunity to taste wines made on site as well as peruse their gift shop.

Note: Bottled water will be provided; guests must be 21 years and older to sample wine.

White River State Park Walking Tour

(3 blocks from The Westin Hotel)

Tuesday, June 15, 2010

11:00 am – 3:00 pm

Includes guided walking tour and admission to:

- Eiteljorg Museum-American Indian and Western Art
- Indiana State Museum (IMAX is separate)
- NCAA Hall of Champions Museum
- Indianapolis Zoo & Botanical Gardens

(Minimum of 25 guests to ensure this tour occurs.)



Evening Events for Registrants and Spouses

These events are included with registration for attendees and spouse/guests.

Annual Welcome Dinner – Lucas Oil Stadium

Sunday, June 13, 2010

7:00 pm – 10:00 pm

Home of the NFL Football Indianapolis Colts, Lucas Oil Stadium is a state-of-the-art facility that opened in 2008. Its retractable roof and incredible views of the Indianapolis skyline make it a truly unique venue. The evening will include guided tours of the stadium, DJ music, bar service, and a buffet dinner plus the kids' favorite concession stand items such as peanuts, popcorn, hot dogs, pretzels, and more.



Annual Chairman's Banquet

Tuesday, June 15, 2010

Dinner and awards ceremony celebrating IDEA and its members. Reception and dinner will take place at the Westin Indianapolis.

For more about Indianapolis visit www.visitindy.com for information on area restaurants, attractions, coupons and much more.

General Information



Travel Information

Indianapolis is served by the new Indianapolis International Airport, one of the most convenient airports in the nation. It is served by 11 airlines and offers approximately 39 daily non-stop flights with additional service to more than 100 locations attracting more than 8.5 million passengers each year. Visit www.indianapolisairport.com/ for more information about the airport and flight details.

Hotel Information

The Westin Indianapolis
50 S. Capitol Ave.
Indianapolis, IN 46204
Phone: 317-262-8100
www.westinindianapolis.com

The Westin Indianapolis is a 573-room hotel with a AAA Four Diamond rating. The hotel has a fitness room, restaurant, lounge, indoor swimming pool and is within walking distance of area attractions, restaurants and shopping.



IDEA has secured special room rates for its attendees. Single and double rates are \$189 and will be available until **May 21, 2010** or until the block is full. To make a reservation online you may use the link www.starwoodmeeting.com/Book/idea2010, visit www.districtenergy.org/calendar or contact the hotel directly at (317) 262-8100 and identify yourself as part of the IDEA conference to receive the \$189 group room rate. A deposit equal to one night's room and tax is required to hold each guest's reservation. These deposits are refundable if notice is received by the hotel at least 48 hours prior to arrival and a cancellation number is obtained.

Attire

Attire for the conference sessions is business casual. Speakers and panelists are advised to wear business attire. The chairman's banquet will be at the hotel and is business attire.

Weather

The normal high temperature in Indianapolis in mid-June is 82 degrees F and the average low is 68.

Photos

IDEA reserves the right to photograph events and participants for historical archiving and future use.

Cancellation Policy

Registrations will be refunded less a \$200 processing fee if registration is cancelled by May 28, 2010. No refunds will be given after May 28, 2010. IDEA cannot be responsible for travel-related delays or cancellations due to weather.

For more information or to register visit www.districtenergy.org/calendar.

IDEA, 24 Lyman Street, Suite 230, Westborough, MA 01581, (508) 366-9229.

Business Partner Exhibitors (as of 3/21/10)

- **7-Technologies**
www.7T.dk
- **Adams Valves, Inc.**
www.adamsvalves-usa.com
- **Applied Engineering Services**
www.applied-e-s.com
- **APV, An SPX Brand**
www.apv.com
- **Auburn Manufacturing, Inc.**
www.auburnmfg.com
- **BA HERCS Corp./ELGE Heat Exchangers**
www.bahercs.com
- **Baltimore Aircoil Company**
www.baltimoreaircoil.com
- **Benz Air Engineering Co., Inc.**
www.benzair.com
- **Burns & McDonnell**
www.burnsmcd.com
- **Caldwell**
www.caldwelltanks.com
- **Carrier Corporation**
www.carrier.com
- **CB&I**
www.cbi.com
- **Chem-Aqua, Inc.**
www.chemaqua.com
- **ChemTreat, Inc.**
www.chemtreat.com
- **Citizens Thermal**
www.citizensenergygroup.com
- **Combustion & Energy Systems Ltd.**
www.condexenergy.com
- **Composite Cooling Solutions L.P.**
www.compositecooling.com
- **The Crom Corporation**
www.cromcorp.com
- **Dresser-Rand**
www.dresser-rand.com
- **DriTherm International, Inc.**
www.dritherm.com
- **DYK Incorporated**
www.dyk.com
- **Elliott Company**
www.elliott-turbo.com
- **Emerson Process Management**
www.emersonprocess.com/rosemount
- **EVAPCO**
www.evapco.com
- **Flexim Americas Corporation**
www.flexim.com
- **Flow Control Industries, Inc.**
www.flowcontrol.com
- **Fuel Tech, Inc.**
www.ftek.com
- **FVB Energy, Inc.**
www.fvbenergy.com
- **GE Sensing and Inspection Technologies**
www.ge.com
- **Gilsulate International, Inc.**
www.gilsulate.com
- **IDE Technologies Ltd.**
www.ide-tech.com
- **Indeck Power Equipment Co.**
www.indeck.com
- **Industrial Resources, Inc.**
www.indresinc.com
- **Insul-Tek**
www.insul-tek.com
- **Jacobs**
www.jacobs.com
- **Johnson Controls, Inc.**
www.johnsoncontrols.com
- **Kessler Ellis Products**
www.kep.com
- **Kroff Chemical Company, Inc.**
www.kroff.com
- **LAKOS Separators & Filtration Systems**
www.lakos.com
- **Le Groupe Simoneau**
www.groupe-simoneau.com
- **Manhole Barrier Security Systems, Inc.**
www.securemanholes.com
- **Manhattan Resources**
www.manhattanresources.com
- **McCrometer**
www.mccrometer.com
- **McQuay International**
www.mcquay.com
- **Miura North America Inc.**
www.miuraboiler.com
- **Nalco Company**
www.nalco.com
- **Natgun Corporation**
www.natgun.com
- **Nationwide Boiler Inc.**
www.nationwideboiler.com
- **Nexterra Systems Corp.**
www.nexterra.ca
- **ONICON Incorporated**
www.onicon.com
- **Optimum Energy**
www.optimumenergyhvac.com
- **OSIsoft**
www.osisoft.com
- **PanGlobal Training Systems**
www.powerengineering.org
- **Parsons Brinckerhoff**
www.pbworld.com/markets/energy/power.asp
- **Perma-Pipe, Inc.**
www.permapipe.com
- **Piping and Corrosion Specialties, Inc.**
www.pipingandcorrosion.com
- **Pittsburgh Corning Corp.- Foamglas**
www.foamglas.com
- **Pure Line Treatment Systems**
www.pureline.com
- **Racine Federated Inc./ Racine Flow Meter Group**
www.racinefed.com
- **Rentech Boilers Systems, Inc.**
www.rentechboilers.com
- **Rockwell Automation**
www.rockwellautomation.com
- **Rovanco Piping Systems**
www.rovanco.com
- **Sega Inc.**
www.segainc.com
- **Siemens Industry Inc.**
www.usa.siemens.com/flow
- **Simpert Technology Inc.**
www.simpert.com
- **Solar Turbines Incorporated**
www.solarturbines.com
- **Sonitec Inc.**
www.vortisand.com
- **Soteica Ideas & Technology LLC**
www.soteica.com
- **Spence Engineering Company, Inc.**
www.spenceengineering.com
- **Spirax Sarco**
www.spiraxsarco.com/us
- **Stantec**
www.stantec.com
- **Stellar**
www.stellar.net
- **Thermacor Process, LP**
www.thermacor.com
- **Thermo Systems LLC**
www.thermosystems.com
- **Tower Engineering, Inc.**
www.tei-usa.com
- **Tower Tech Inc.**
www.towertech.com
- **Trane**
www.trane.com
- **Tricon Piping Systems, Inc.**
www.triconpiping.com
- **Uponor, Inc.**
www.uponor-usa.com
- **Urecon Ltd**
www.urecon.com
- **US Water Services**
www.uswaterservices.com
- **Utility Programs & Metering II**
www.up-m.com
- **Veris, Inc.**
www.veris-inc.com
- **Watson McDaniel Co.**
www.watsonmcdaniel.com
- **Zwick Armaturen GmbH**
www.zwick-valves.com

Preliminary Conference Program-at-a-Glance

(Times subject to change. For updates, please visit www.districtenergy.org)

Sunday, June 13

7:00 am – 2:00 pm	Annual IDEA Golf Tournament for 1934 Champions Cup – Brickyard Crossing Golf Resort; additional fee for registrants
8:00 am – 3:30 pm	Exhibitor Setup
8:00 am – 6:00 pm	Conference Registration Open
11:45 am – 3:30 pm	Tour of Indianapolis – Included with spouses/guest registration; additional fee for conference attendees and children.
5:00 pm – 7:00 pm	Exhibit Hall Grand Opening/Welcome Reception with IDEA Business Partners
7:00 pm – 10:00 pm	Annual Welcome Dinner – Lucas Oil Stadium, Home of the Indianapolis Colts - Included for full conference and spouse/guest registrants; additional fee for children.

Monday, June 14

7:00 am – 8:00 am	Continental Breakfast with IDEA Business Partners – Exhibit Hall
7:00 am – 6:30 pm	Registration Open
8:00 am – 12:15 pm	Conference Opening Plenary Sessions – Creating an Efficient Energy Future
9:00 am – 3:00 pm	Spouse/Guest Tour - Brown County & Oliver Winery Tour – Included for spouse/guest registrants; additional fee for children.
10:30 am – 11:00 am	Refreshment Break with IDEA Business Partner Exhibitors – Exhibit Hall
12:15 pm – 1:30 pm	IDEA Recognition Luncheon and Keynote Address
1:30 pm – 2:00 pm	Dessert with IDEA Business Partner Exhibitors – Exhibit Hall
2:00 pm – 3:30 pm	Technical Sessions
3:30 pm – 4:00 pm	Refreshment Break with IDEA Business Partner Exhibitors – Exhibit Hall
4:00 pm – 5:00 pm	Technical Sessions
5:00 pm – 6:30 pm	Reception with IDEA Business Partner Exhibitors

Tuesday, June 15

7:00 am – 8:30 am	Continental Breakfast with IDEA Business Partners
7:00 am – 5:00 pm	Registration Open
7:00 am – 8:00 am	IDEA Member Forum Meetings – Business Development, Operations, District Cooling and Sustainability Forums
7:30 am – 8:00 am	Speaker Ready Meeting
8:00 am – 10:30 am	Technical Sessions
10:30 am – 11:00 am	Refreshment Break with IDEA Business Partner Exhibitors
11:00 am – 12:00 pm	Technical Sessions
11:00 am – 3:00 pm	Spouse/Guest Tour – White River State Park Walking Tour – Included for spouse/guest registrants; additional fee for children.
12:00 pm – 1:30 pm	IDEA Annual Business Meeting, Awards and Recognition Luncheon
1:30 pm – 2:00 pm	Dessert with IDEA Business Partner Exhibitors – Exhibit Hall
2:00 pm – 3:00 pm	Technical Sessions
2:30 pm – 5:00 pm	Exhibit Hall Tear Down
3:00 pm – 3:30 pm	Refreshment Break
3:30 pm – 5:00 pm	Technical Sessions
6:00 pm – 10:00 pm	IDEA Annual Chairman's Banquet (Business Attire)

Wednesday, June 16

7:30 am – 9:15 am	Registration Open
8:00 am – 9:00 am	District Energy Technical Tours Preview Breakfast – An Overview Of Technical Tour Locations and Facilities
9:15 am - 12:15 pm	Technical Tours – Citizens Thermal Perry K Steam Plant and West Street Chilled Water Facility

Del Monte's Super Boiler:

Ultra-efficient unit bears fruit, reducing emissions

Robert P. Benz, PE, President, Benz Air Engineering Co. Inc.

The majority of steam boilers operating today are based on designs developed in the 19th century, a period when highly polluting heavy oil was the most available fuel. Engineers at the time were more concerned about preventing acid corrosion and maintaining convective passes of air heaters and economizers than optimizing efficiency. As a consequence, most boilers operating today have efficiencies that are less than 81 percent.

Such low efficiencies have a significant impact on the country's energy consumption, since approximately 40 percent of all the energy used in America is consumed in boilers. The importance of boilers in our energy mix, the volatility of energy costs and the increased emphasis on reducing carbon footprint have combined to heighten the urgency to improve boiler efficiency and emissions. This has spurred research and development toward the so-called "Super Boiler": an ultra-high-efficiency, ultra-low-emissions compact gas-fired packaged boiler originally conceived of by the U.S. Department of Energy.

At the Del Monte Foods plant in Modesto, Calif., the Super Boiler concept

has become a reality. The company has developed an innovative new boiler system that is not only helping its plant meet – and exceed – California's stringent greenhouse gas reduction targets but is also serving as an example for other local food processors.

Super Performance

As envisioned by the DOE, the Super Boiler has a fuel-to-steam efficiency that exceeds 93 percent while emitting nitrogen oxides at no more than 5 ppm. Attaining this level of efficiency is no small feat given the thermodynamic lim-



Del Monte Foods' Super Boiler flue gas condensing heat exchanger has a boiler fuel-to-steam efficiency exceeding 93 percent.

Courtesy Del Monte Foods Modesto.

its of the process. More than 10 percent of the energy evolved from the combustion of natural gas is locked up in the form of water vapor. Hence, efficiency cannot be increased above 90 percent without condensing some of the water vapor in exhaust, which, given the dew point of 130-138 degrees F, limits the available heat sinks.

Progressive Thinking

It stands to reason that such an efficient application would be of interest to companies located in areas with special environmental concerns. The same topography that makes California's 450-mile-long Central Valley the most productive agricultural area of the nation also contributes to the area's classification as a severe ozone nonattainment zone by the U.S. Environmental Protection Agency. In the effort to reduce the area's ozone levels, the San Joaquin Air Pollution Control District (SJAPCD) has subjected owners of steam boilers in the Central Valley to the nation's strictest limits on NOx emissions at 6 ppm. California is the only state to draft legislation mandating a 20 percent reduction in carbon dioxide emissions through a combination of market-based incentives and energy efficiency rebates.

Del Monte Foods' plant manager realized that to meet future emissions mandates, the Super Boiler would have to become reality.

After being notified in 2003 of the 6 ppm NOx limit, Jim Mortensen, Del Monte Foods' plant manager in Modesto, in the heart of the valley, realized that to meet all future NOx and CO₂ emission mandates, the Super Boiler would have to become reality. Thinking progressively, Mortensen set about to make his steam plant upgrade the first to demonstrate Super Boiler steam-generating performance using commonly available technologies.

The Modesto plant was originally built in 1968 to process tomatoes. During the four-month pack, the facility's two 155,000-lb/hr D-type boilers would run near full load, providing steam used to evaporate water from juice to form tomato paste. Starting in 1995, the SJAPCD restricted NOx emissions from boilers to a concentration no greater than 30 ppm corrected to 3 percent. Aware of substantial problems associated with low-NOx burner retrofits, Mortensen and his chief boiler operator, Ed Connor, decided to research low-NOx installations on boilers of similar size and design.

Low-NOx burners were typically designed to inject the fuel farther into the firebox, the lower temperature of the longer flame resulting in lower NOx emissions. Recirculating around 20 percent of the stack gas volume back into the combustion air, the low-NOx burners were able to meet the required limit, but not without complications. The different flame pattern of the new burners often resulted in reduced boiler steam output, a consequence that the Modesto facility could not afford.

Mortensen and Connor discovered an alternative to burner replacement that used essentially the same amount of recirculated flue gas. The new technology relied on a far more accurate control of combustion air to reduce NOx by lowering the available oxygen needed to form NOx. In 1996, the Modesto facility opted to retrofit its boilers with the Compu-NOx system: a fuel, air and flue gas recirculation control system that used variable-speed drives instead of dampers to closely match combustion air and recirculated flue gas to burner fuel flow.

In addition to meeting the NOx limits and maintaining capacity, the near-stoichiometric combustion resulted in higher fuel-to-steam efficiency. While most facilities considered the expense to meet NOx emissions targets a sunk cost, the Modesto facility realized a simple payback within one year.

In 1998, Del Monte Corp. decided to convert the Modesto facility into a fruit-processing plant, resulting in a substantial change in steam demand. Operating year-round, Del Monte's new fruit cup line required between 2,000-

and 40,000-lb/hr 60 psig steam. The can cookers used to process fruit during the summer harvest season used up to 150,000 lb/hr of 145 psig steam.

The facility staff realized that the boiler plant was significantly oversized for providing the wide variation in steam demanded of the new fruit lines. Analysis of steam plant operation data confirmed that one of the large 155,000-lb/hr boilers with its unprecedented 75-to-1 turndown could provide the steam needed by the fruit cup line – but there was a significant 'excess-air' efficiency penalty due to the distribution of fuel around the large burner circumference.

The fuel-to-steam efficiency for the average 10,000-lb/hr steam that needed to be delivered to the fruit cup line was only 70 percent. Given the deadline to meet lower NOx emissions in 2004, the facility decided that the most cost-effective solution would be to decommission one of the existing boilers and replace it with a boiler better matched to the plant's actual steam demand. After careful consideration of the existing loads, Del Monte decided optimum capacity of the new boiler would be 50,000 lb/hr.

Near-Zero NOx Emissions

The SJAPCD created an incentive for boiler owners to retrofit to the new lower NOx limits in 2003. Those owners who retrofitted their boilers by 2004 would be allowed to emit 9 ppm, which could be met with ultra-low-NOx burners, while those who waited an extra year would be required to meet 6 ppm – most likely requiring selective catalytic reduction (SCR). The high amount of recirculated flue gas required of the ultra-low-NOx burners to maintain emissions in the single digits severely impacted flame stability, which typically limited turndown to no more than 3-to-1. That fact – combined with the significantly reduced boiler capacity resulting from using ultra-low-NOx burners – motivated Del Monte to retrofit its boilers with SCR.

SCR involves the placement of a catalyst within the exhaust gas stream of the boiler. Ammonia is mixed with the exhaust gas flowing through the

catalyst, causing the reduction of NOx. The technology is capable of reducing NOx emissions to near zero.

Selective catalytic reduction technology is capable of reducing NOx emissions to near zero.

Del Monte knew that while today's limit may be 6 ppm, continued high pollution levels in the valley would most likely result in the imposition of lower emission limits for its boilers. Accommodating for this scenario, the facility decided to

specify an SCR that would deliver a 5 ppm NOx reduction with an incoming NOx level of 50 ppm. Lower NOx could be attained by merely adjusting the Compu-NOx to deliver lower NOx to the catalyst.

Generating Electricity for Less

The local utility had been raising Del Monte's electricity rate needed to process fruit every year, with electricity projected to exceed 12 cents/kWh by 2010. Mortensen and his staff looked to dampen the effect of these regular rate increases, recognizing the electric-generating potential from using a back-pressure turbine to provide steam to the 60 psig header feeding the fruit cup line. A feasibility study was conducted

to find the optimum steam conditions to specify for the new boiler, concluding with 275 psig and 494 F and the back-pressure steam turbine generating electricity for less than 2 cents/kWh.

Del Monte hired TurboSteam of Turners Falls, Mass., to provide a payback analysis and a price quote for a turbine generator with financing. TurboSteam supplied a package design comprising a single skid with one induction generator that guaranteed 77 percent efficiency over a 10-to-1 turndown. The steam turbine would be installed with a desuperheating valve to maintain steam pressure in the event of turbine trip or at extreme low-load conditions (fig. 1).

The operational data also served to establish a baseline of steam system efficiency that would be compared to the efficiency resulting from the upgrades. Rebates available from California's energy efficiency rebate program would increase the return on investment from the lower cost of operation resulting from efficiency.

Incorporating Stack Gas Heat Recovery

Only a small amount of condensate from the steam to the new processing lines could be recovered, the majority of the 60 F makeup water being preheated with process steam in the deaerator. The process also required a substantial amount of hot water, which was also heated with process steam. Recognizing these various sources represented a substantial heat sink, Mortensen enlisted Benz Air Engineering Co. to design and incorporate a heat recovery system into the new boiler project.

A pinch analysis of preheating boiler makeup and process water using boiler flue gas heat recovery was used to design a condensing heat exchanger. The resulting design (fig. 2) integrated the condensing heat exchanger into the boiler system, which, when combined with the control system, yielded some novel features that would result in efficiency exceeding 93 percent:

- Installation of an additional heat exchanger between the makeup water and the feed water provided significant reduction in the needed

Figure 1. Back-Pressure Steam Turbine, Del Monte Foods' Super Boiler.

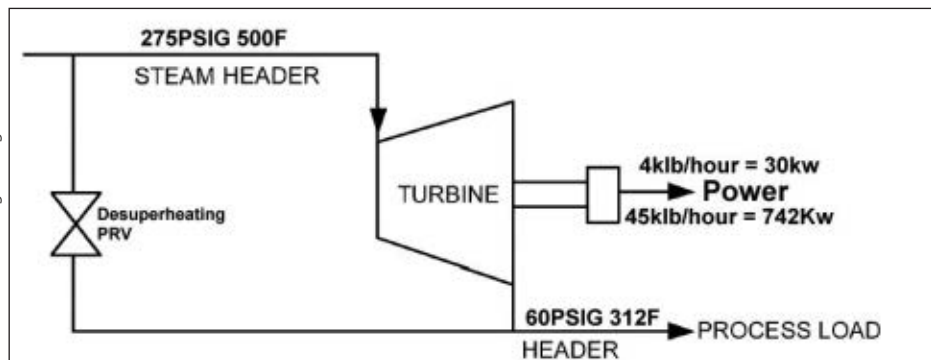
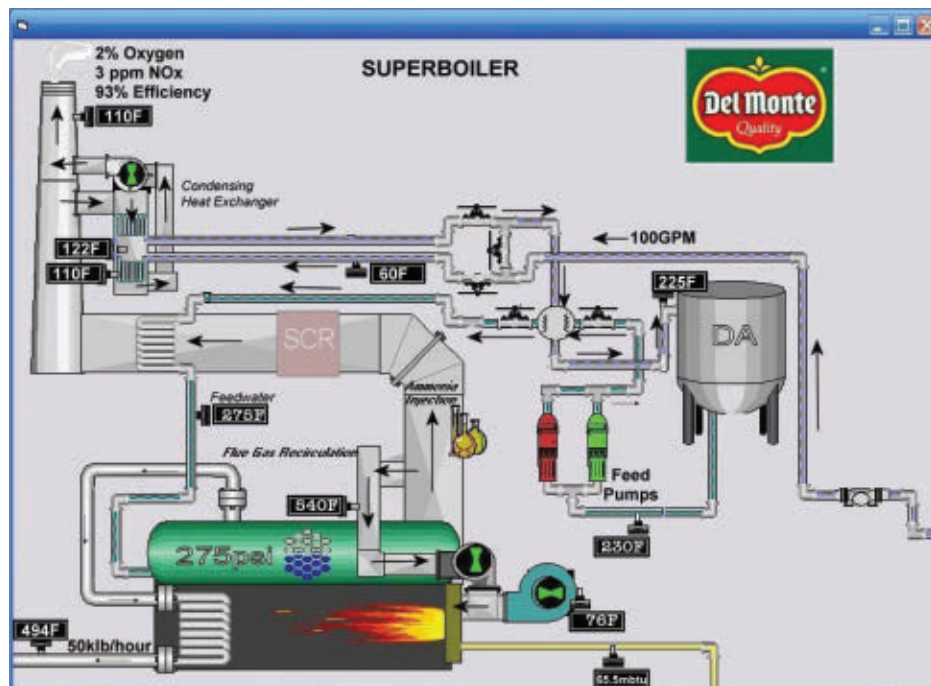


Figure 2. Del Monte's Super Boiler: Full-Load Boiler and Heat Recovery Process.



heat transfer of the condensing heat exchanger.

- The condensing heat exchanger design was an active draft system, imparting no change to the boiler combustion system. This design feature is particularly important due to maintaining the boiler air-fuel ratio at lower loads while allowing bypass of the system during operation.
- The counter-flow design – in which the condensed products of combustion flow downward opposite the direction of the makeup water – prevented the re-evaporation quenching of flue gas. This maintains the humidity ratio of the flue gas, optimizing the heat transfer to the makeup water.
- Flue gas condensate collected within the dropout volume under the downstream stainless coil is pumped back to the makeup water line coming out of the upstream coil, contributing up to 7 percent of the total makeup water flow to the boiler.
- Capacity for preheating up to 50 gpm of process or makeup water was added. 110 F saturated flue gas still contains nearly 7 percent of the total energy input to the boiler. The additional flow capacity of the last coil would increase efficiency to 94.5 percent.

System Control and Optimization

The supervisory control system was designed based on an Allen-Bradley ControlLogix platform. The system allowed for combustion control with additional control added for feed water flow control, makeup water flow control, SCR ammonia flow control, condensing flow control, feed water-to-makeup water flow control, steam superheat control and the emission-monitoring system control. A proportional-integrative-derivative controller was developed for the human machine interface, running on a PC platform and written in Visual Basic.

The control system relied on variable-frequency drives for controlling the various flows throughout the system. While each of the water flow loops had venturi-based flow measurement, the

system control using variable-frequency drives greatly simplified the system control over that of using setpoint control.

Economic Justification

Mortensen finalized the steam system upgrade of his facility, which comprised the following:

- 50,000-lb/hr boiler designed to provide 275 psig steam 494 F superheat with a conventional burner provided by Nationwide Boiler
- combustion control system provided by Benz Air Engineering
- SCR system provided by Nationwide Boiler, sufficiently sized to reduce NOx from 50 ppm to less than 5 ppm
- back-pressure steam turbine, provided by TurboSteam, to generate up to 750 kW of electricity from the expansion of 40,000-lb/hr 275 psig, 494 F steam to 60 psig
- flue gas condensing heat exchanger provided by Benz Air Engineering, sized for preheating up to 150 gpm from 65 F to 146 F using 12,400 standard cu ft per minute flue gas entering at 175 F and 2 percent excess oxygen and 10,200 scfm leaving at 101 F, resulting in 7.8 gpm of additional condensate
- supervisory control system integrated with the combustion control system for seamless integration of external components through remote racks, programming and design provided by Benz Air Engineering

The back-pressure turbine was financed over 10 years with an upfront down payment and a yearly cost of \$68,000. The cost of the steam plant upgrade was estimated to be \$1,665,000, which included 14 percent additional contingency due to the novel aspects of the proposed system. The baseline energy costs included natural gas at \$8/MMBtu and electricity at \$0.07/kWh. Subtracting a \$262,000 rebate from Pacific Gas & Electric, the total upfront cost of the upgrade was \$1,403,000, resulting in a simple payback of 3.85 years.

Verified Results

The project commenced construction in fall 2006, and the system was commissioned in June 2007. PG&E performed an energy audit of the system that verified

a boiler fuel-to-steam efficiency of 94.5 percent, the higher efficiency resulting from preheating additional process water needed by the plant.

Del Monte Foods Modesto demonstrated a design for other food processors to duplicate. A subsequent increase in the efficiency rebate offered by PG&E from \$8 to \$11/MMBtu saved over the year prompted Pacific Coast Producers, Seneca Foods and SunOpta to install boiler upgrades using the same technology pioneered by Del Monte. This resulted in a total verified reduction of 5,582 metric tons of CO₂ per year, which would be equivalent in greenhouse gas savings to the following:

- 1,211 passenger cars not being driven for one year
- 715 households not using electricity for one year
- 143,163 tree seedlings grown for 10 years
- 635,909 gallons of gasoline
- 48 acres of forest preserved from deforestation

The obsolescence of pneumatic control systems with far more powerful microprocessor-based control systems has generally separated the field of energy engineering into either electrical or mechanical engineering. In some cases, this compartmentalization of expertise has severely hampered the efforts of district energy managers to implement efficiency upgrades. The success of the Del Monte Modesto Super Boiler project is primarily a result of management's sourcing design and engineering to individuals possessing a broad-based knowledge of heat transfer, combustion and control system engineering.



Robert P. Benz, PE, is president of Benz Air Engineering Co. Inc. With more than 27 years of experience in combustion engineering, Benz supervises the implementation of combustion

control solutions for maximum efficiency and lower emissions for central plants. He pioneered the use of variable-speed drive technology of fans for precisely metering air flow, a process for which he was granted a U.S. patent. Benz holds a bachelor of science degree in mechanical engineering from Oregon State University and is a registered professional engineer in California, Nevada and Texas. He may be reached at RBenz@benzaireng.com.

A Pioneering Partnership in China:

Foreign investment spurs district heating growth

Timothée Prenz, Project Officer, Dalkia Asia Pte. Ltd.

Buildings in cities across China have long relied on small coal-fired block “boiler houses” as their main heating source. These boiler houses, however, have contributed to significant air pollution problems in the country, with their low efficiency and lack of effective emissions control systems. In response, the Chinese government has issued regulations – the first, nearly 25 years ago – encouraging local authorities to close down small coal-fired operations in favor of large district heating systems (see sidebar).

But the development of district heating has been slower than planned – primarily because local authorities have not been able to afford to install new systems, and the regulations themselves have not provided financial incentives for cities to do so. This situation has opened up opportunities for foreign investment in China’s district heating infrastructure.

Dalkia, the district energy subsidiary of Veolia Environnement and Electricité de France – respectively world leaders

in environmental services and in power generation, recently entered the Chinese market. In 2007 the company signed a 25-year agreement with the northeastern municipality of Jiamusi to manage its existing urban heating network. The agreement was the first district heating contract granted by China under a new “concession framework” allowing private companies to partner with public utilities.

Even after just two years under the new agreement, Jiamusi’s district heating system has been significantly modernized and expanded. Network coverage has increased by 56 percent. The share of heat supplied by coal-fired block boiler houses to the network has shrunk from 30 percent in 2005 to 10 percent in 2009, and the local air quality is benefiting as a result: 65,000 fewer tons of carbon dioxide were released in the 2008-2009 heating season compared to the year before. Such progress has earned the Jiamusi system a number of local and provincial honors, as well as one of the first-ever District Energy Climate Awards presented

by the International Energy Agency (IEA) last November at the global District Energy Summit in Copenhagen.

Groundbreaking Partnership

The framework of Dalkia’s concession agreement with the municipality gives the company the exclusive right to operate, maintain and carry out investment in a public utility (heating services) for a given number of years (25) and a given geographical perimeter (the city of Jiamusi). The Chinese Ministry of Construction has stipulated that heating sector projects shall conform to this framework and that foreign entities shall be granted the right to acquire majority shares in any heating company in the three northeastern Chinese provinces (Heilongjiang, where Jiamusi is located, as well as Jilin and Liaoning). Foreign investors may hold minority stakes in district heating systems located elsewhere.

Dalkia’s aim is to replicate in mainland China its successful development

Table 1. Dalkia's District Heating Operations in China.

	Jiamusi	Harbin	Chongqing
Services	Heating	Heating	Industrial utilities (steam) and electricity sales to the grid
Scope	Concession of 25 years	Acquisition of heating company	Acquisition of cogeneration
Ownership Structure	65% Dalkia Asia Pte. Ltd. 35% Jiamusi New Times Urban Infrastructure Construction and Investment (Group) Co. Ltd.	95% Dalkia Asia Pte. Ltd. 5% Harbin Property Heating Group Co. Ltd.	85% Dalkia Asia Pte. Ltd. 15% Chongqing Changshou Electric Power Industries Co. Ltd.
Incorporation	April 5, 2007	July 13, 2007	July 30, 2008
System	Heating network and 9 boiler houses	Cogeneration and heating network	Cogeneration
Production Capacity	140 MWth from peak boilers and 500 MWth from third-party CHP plants	150 MWe	25 MWe (and 25 MWe under construction)
Targeted Supplied Geographical Area	14.5 million sq m (5.6 sq miles)	17.5 million sq m (6.8 sq miles)	N/A

Source: Dalkia Asia Pte. Ltd.

Evolving Policy: China's pro-district heating regulations

China enacted its first national regulation stipulating demolition of small independent boilers in 1986, in Article 22 of "The Development of District Heating Systems" published by the Chinese State Council. According to this article, independent boilers under the following capacities shall be demolished:

- 80,000 lb/hr in big towns
- 40,000 lb/hr in average towns
- 20,000 lb/hr in small towns

This regulation was not followed to a large extent as there were no specific financial incentives to do so. In the 1980s and 1990s, some incentives were implemented for cogeneration development, including state subsidies and tax exemption on heat sales. These were terminated in the late '90s due to China's transition to a free market economy. The overall capacity exceeded demand at that time; therefore, cogeneration development slowed down.

To revive cogeneration development, in line with environmental policies, the Chinese government published a new directive in 2000 pertaining to large-scale cogeneration (greater than 200 MW), stating that a company granted with a heating concession shall not be in competition with independent cogeneration and boilers.

A revision of this directive was published in 2004, called "Recommendation for the Development of Cogeneration." It contained some new laws in favor of the demolition of small independent boilers, including some articles stating that local governments shall develop strategies to promote environment protection, energy savings and sustainable development and that a share of the budget shall be allocated to district heating system development.

Local governments have political incentives to implement these changes; however, as in the past, no financial incentives or deadlines have accompanied these new policies. Their implementation, therefore, has been limited.

Snapshot: Jiamusi, People's Republic of China

- Municipality population: 2.45 million; 820,000 in city of Jiamusi
- Third-largest city in Heilongjiang Province
- Located in the extreme northeast of the country, 100 km (62 miles) from the Russian border
- 1,800 km (1,118 miles) from the country's capital of Beijing
- 5,073 heating degree-days annually
- Average temperature December-February is minus 18 C (minus 0.4 F)
- Heating season from Oct. 15 to April 15



in improving district energy efficiency in Eastern Europe where Dalkia has become a major district heating provider. Similar to Europe, China has set a fixed heating temperature of 18 degrees C (64 degrees F) for building interiors, which contributes to effective energy management. In China, Dalkia now has existing operations in Jiamusi, Harbin and Chongqing (table 1). (While Jiamusi and Harbin are located in northeastern China, where the government allows foreign investors to have a majority stake in district heating systems, Dalkia's majority share in the Chongqing combined heat and power system, located in southeastern China, was also allowed as it is an industrial CHP system and therefore not subject to the same regulations as the heating sector.)

Dalkia first started exploring the possibility of entering the heating market in Jiamusi in 2005. The company assessed that the city's total service area for heating from all sources – district heating, block boilers, individual heating, industrial heat, etc. – was 18.9 million sq m (7.3 sq miles). Of this, Dalkia determined that 14.5 million sq m (5.6 sq miles) could be connected to its district heating network.

The urban heating network of Jiamusi Heating Company (JHC), a com-

pany owned by the municipality, was already supplying 29 percent of the total heating surface, i.e., 5.5 million sq m (2.1 sq miles). JHC's demand peaked at 410 MWth, 70 percent of which was supplied by two local CHP plants: Heilongjiang Huadian Jiamusi Electricity Generation Co. Ltd., owned by one of the top five Chinese power-generating companies and located in the eastern part of Jiamusi; and Jiamusi Longshi Thermoelectricity Co. Ltd., owned by the municipality and located on the west side of the city. The rest of JHC's demand was supplied by the company's own peak-load boilers.

JHC had been in chronic deficit for more than a decade and therefore lacked the financial strength to raise the funds to meet the city's development objectives. JHC's assets also suffered from reduced maintenance, which resulted in large energy and water losses. This in turn led to increased dissatisfaction from the users as interruptions of service and low indoor temperature became the norm.

In May 2007, Dalkia signed the concession agreement to manage the former JHC's network. A new joint venture, Dalkia (Jiamusi) Urban Heating Co. Ltd. (Dalkia Jiamusi), was set up with minority participation from a municipal utility company, Jiamusi New Times

Urban Infrastructure Construction and Investment (Group).

Dalkia acquired the heating pipelines and some boiler houses, which serve as peak-load plants. Today the peak-load plants comprise 10 percent of Dalkia Jiamusi's energy mix; the rest is provided by the two local CHP plants. The two CHP networks are not connected to each other; however, the company's peak-load boilers are connected to the two networks.

The difficulty in securing financing for district energy in China was overcome by Dalkia through collaboration with the Asian Development Bank (ADB), in similar fashion to its earlier cooperation in Eastern Europe with the European Bank for Reconstruction and Development. The collaboration was in line with ADB's objective of supporting energy efficiency and environmental protection in China. It will be phased out gradually when commercial lending becomes more readily available for district energy companies in the country.

New Solutions, Connections

The project took two years to materialize as it was the first concession agreement in the heating sector in China. Now, after two years of operation, Dalkia Jiamusi has increased network coverage by 56 percent to 8.6 million sq m (3.3 sq miles), where 73 percent of Dalkia Jiamusi's customers are residential and 37 percent are nonresidential, including commercial and public buildings. The company aims to provide district heating service to a geographic area covering 14.5 million sq m (5.6 sq miles) by 2020 (75 percent of the city's total heating service area).

The company aims to provide district heating service to 75 percent of the city's total heating service area by 2020.

Network Modifications

Toward its goal of expanding the network, Dalkia Jiamusi formulated a development strategy for Jiamusi's



Pipeline for the north feeder was laid in 2009, crossing over a small river.

central zone and the two largest development zones in the west and east of the municipality. This strategy translated into three main investment programs:

- modification of the east network from 85 C (185 F) heat supply to 95 C (203 F) heat supply
- construction of a new north feeder with 120 C (248 F) heat supply
- construction of a new south feeder with 120 C (248 F) heat supply

The capacity for growth of the original Jiamusi urban heating system was limited by its network configuration, even though the two existing CHP plants were capable of delivering more heat from their existing capacities. The major part of the existing network had been designed to supply hot water from the eastern CHP plant directly to numerous radiators in the end-users' premises. This limited the heat supply temperature to 85 C (185 F) and the pressure to a maximum of 6 bar (87 psig), and subjected the network to large heat losses as it was losing water at a rate of 1,200 cu m per hour (317,000 gph).

To overcome these technical constraints, Dalkia Jiamusi built approximately 90 new substations on the eastern network after taking over the management of the network in summer 2007. This enabled the primary water supply temperature to be raised to 95 C (203 F) and enabled the existing network to be connected to additional areas previously supplied by independent block boiler houses. (Since the ground is frozen for six months, work on the network can only be performed from April 15 to Sept. 15.)

With the construction of the north feeder beginning in 2009 and the south feeder beginning in 2012, Dalkia Jiamusi will be able to increase the supply temperature to 120 C (248 F), buy more energy from the larger east cogeneration plant and increase the total supplied area to its targeted goal of 14.5 million sq m (5.6 sq miles).

The network expansion achieved to date has already enabled Dalkia Jiamusi to buy more, cleaner energy from the two CHP plants. As a result, 64 independent coal-fired boiler houses and nine JHC coal-fired boiler houses were removed in 2008. Between 2007 and 2008, 179 sub-

stations were renovated and/or installed, and 21 new substations will be built in 2009 to 2010. More than 5,500 valves on the primary and secondary networks have also been replaced. These upgrades have decreased the average age of network components.

Other System Improvements

Beyond the distribution system and plant upgrades, Dalkia Jiamusi has made numerous other improvements – in automation, communications and customer service – that are also vital to the system's success. The company installed a SCADA (supervisory control and data acquisition) system enabling real-time management of the substations and the network, which has optimized energy efficiency and users' comfort. Dalkia also implemented its proprietary enterprise resource planning system, with specialized modules on maintenance management, energy management, fuel supply and customer service.

The company now communicates with the public via newspapers, local radio, a new Web site and an information stand in the city's main square. To deliver better customer service, Dalkia Jiamusi has introduced a 24-hour customer help desk, begun conducting annual customer satisfaction surveys, opened three strategically located fee collection offices, issued smart cards to facilitate customer payments and offered elderly and handicapped people transportation to and from the collection offices – all of which has helped bring down customer bad debts from 7 percent to 2 percent.

Already Reducing Environmental Impact

The modernization and modification of JHC's former network design has significantly improved energy efficiency and reduced water loss. Dalkia Jiamusi's various system improvements have already accomplished the following:

- reduced CO₂ emissions by more than 65,000 tons in the 2008-2009 heating season over the prior year
- reduced energy consumption per square meter by 6.6 percent in the 2008-2009 heating season over the prior year

- eliminated the use of 26,000 tons of standard coal in the 2008-2009 heating season compared to the prior year
- reduced water loss in the pipeline by 23 percent in the 2008-2009 heating season compared to the previous year
- decreased heat supplied by coal-fired block boiler houses from 30 percent in 2005 to 10 percent in the 2008-2009 heating season

In the future, the company expects to achieve the following additional reductions in CO₂ emissions:

- 70,000 tons/year of CO₂ by reducing network loss (around 1.7 million tons of CO₂ over 25 years)
- 200,000 tons/year of CO₂ by connecting buildings that will switch from low-efficiency heat-only boilers to Dalkia Jiamusi's network (around 5.2 million tons of CO₂ over 25 years)
- 20,000 tons/year of CO₂ if Dalkia proceeds with the first phase of a geothermal project

The future may also hold the development of geothermal heating in Jiamusi, where studies have indicated the presence of geothermal resources. The company's technical, financial and feasibility evaluation of these



Dalkia Jiamusi's contribution to the local environment includes participation in community activities. Shown here, the company and its staff donated money to help the earthquake-hit Sichuan area. Among other efforts, Dalkia employees have provided food to needy area families, and the company has put jobless women to work, paying them to make quilts for insulating valves, heat exchangers and other accessories inside substations.

resources should be completed by July 2010. Assuming study results confirm project feasibility, Dalkia intends to develop a 10-15 MW capacity installation for the initial phase. Ideally, a two-well geothermal installation will be used, which re-injects the water to the ground and therefore preserves water resources. (This technique is not widely used in China.)

Biomass is another potential renewable energy resource as Jiamusi is located in the middle of large corn-fields. Rice husk, rice and corn straw are common biomass sources in China. While there are opportunities to develop biomass as a fuel in Jiamusi, Dalkia will implement such a project only if viability is confirmed by a feasibility study.

Making a Difference

The modernization of Jiamusi's municipal heating network has not only helped Dalkia achieve its goals of expanding the system and boosting

energy efficiency, but it has also yielded the effect intended by the Chinese government when it opened the door for private-public partnerships in the heating sector: Fewer coal-fired block boiler houses are operating in the municipality today, and greenhouse gas emissions and water losses have been cut.

These accomplishments have been recognized with numerous local and provincial awards bestowed on the system, including 2009 Respectful and Straight Company, 2008 Most Important Company in Jiamusi, 2008 Customer Service Award of Heilongjiang Province and 2007 Exalted Company Which Influences Sanjiang People's Life Most.

As noted earlier, global recognition came in November 2009 when the IEA presented Dalkia with a District Energy Climate Award at the District Energy Summit in Copenhagen. Only six systems from around the world were honored with this new award, conferred at the event. Held for the first time,

the summit was organized by the IEA in conjunction with IDEA, Euroheat & Power and the Danish District Heating Association.

Though results of Dalkia Jiamusi's modernization strategies are already evident, the system remains on course toward further growth and efficiencies – and supporting China as it seeks to build out its district heating infrastructure. 



Timothée Prenez is based in Beijing, China, as a project officer with Dalkia Asia Pte. Ltd., a position he has held for the past four years. His focus is identifying and developing investment opportuni-

ties for the company in China. He has a Sino-French bachelor's degree in Chinese business and international business from the CESEM Management School in Reims, France, and from the University of International Business and Economics in Beijing, China. Prenez may be reached at timothee.prenez@dalkia.cn.

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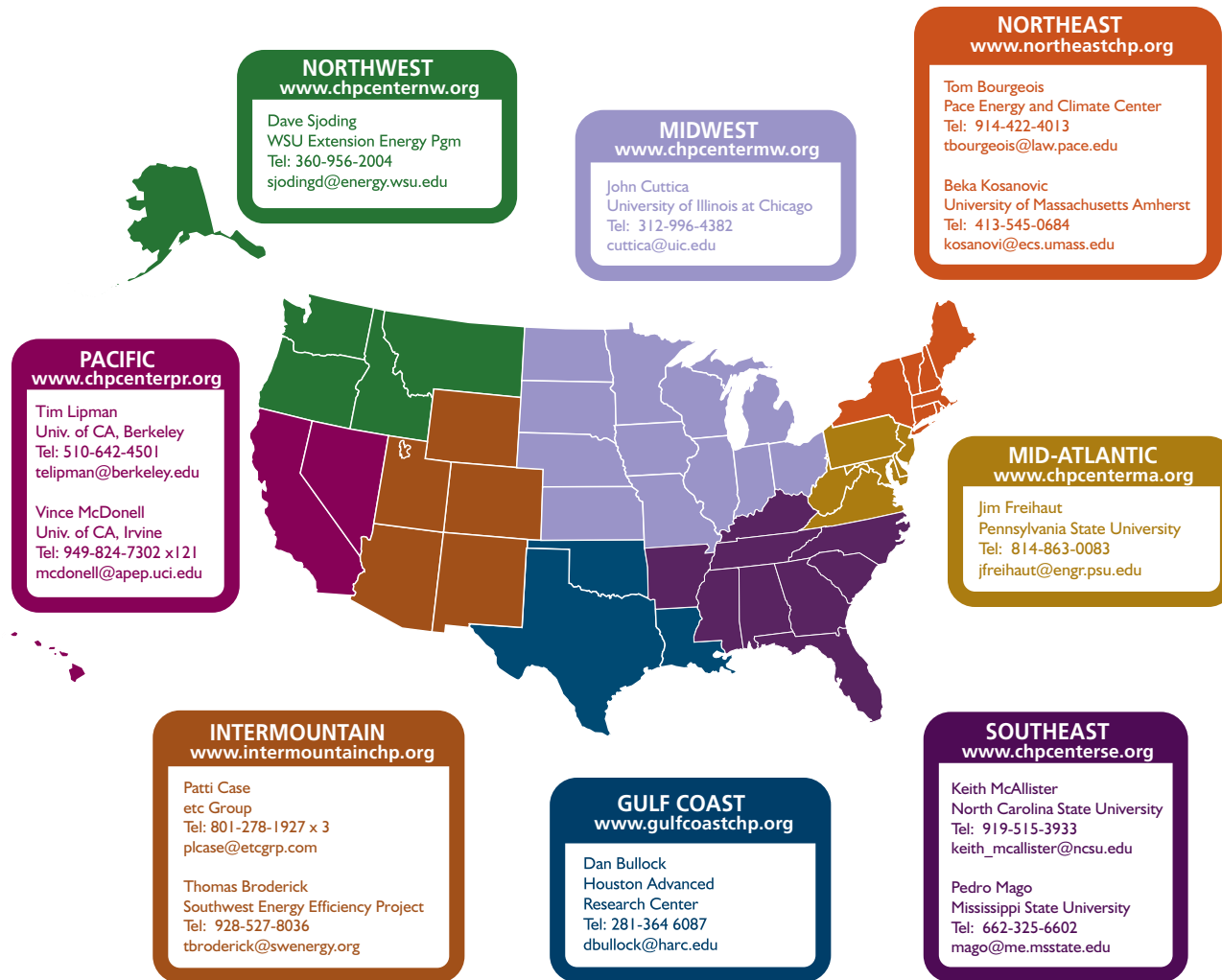


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“Repowering” in Reno: Campus conference focuses on challenges, opportunities

Modernizing. Managing for greater efficiency. Investing in enhanced technology. Lowering carbon emissions. Campus utility systems across the country are actively retooling their operations to meet the challenges and opportunities of today’s carbon- and capital-constrained economy – in essence, “Repowering the Future.” That was the theme of IDEA’s 23rd Annual Campus Energy Conference, where association members and other industry professionals gathered to share their insights on operating district energy systems successfully both now and long-term. Hosted by the

University of Nevada, Reno, the event took place Feb. 9-12 at the Peppermill Reno Hotel.

Setting the Tone

The conference theme proved timely and relevant as it was reinforced by remarks in the opening plenary session by eight panelists from many of the nation’s leading institutions. Their discussion set the conference tone and agenda. Jim Adams of Cornell University spoke of implementing a Climate Action Plan, with the recent commencement of a natural gas-fired combined heat and power facility that will substantially reduce reliance on coal and cut direct emissions of CO₂. Significant investments like campus CHP must be analyzed through a range of fuel price scenarios and a combination of economic and environmental lenses, including life-cycle cost analyses with sensitivities to fuel volatility and future value of carbon allowances.

Ray DuBose of The University of North Carolina (UNC) at Chapel Hill, chair of last year’s campus energy conference, discussed the long-term significance of sustainability at UNC and the important role that the campus utility department plays in sustainability planning, evaluation, implementation and ongoing education.

Juan Ontiveros, current IDEA chair from The University of Texas at Austin,

outlined his campus’s continuing efforts to enhance utility system energy efficiency by incorporating new monitoring and modeling tools that more fully identify operational efficiencies in production, distribution and operation of customer buildings.

Likewise, Princeton University is tightening systems and insulating equipment all across campus. According to Tom Nyquist, Princeton is looking to maximize operational efficiency of its cogeneration system, aided in part by recent state legislation that reduces sales and use taxes on natural gas for cogeneration. This legislation also allows operators to effectively “wheel power” through the local electrical distribution grid to customers also served with thermal energy through district energy networks.

Jeff Zumwalt of The University of New Mexico and Steve Swinson of Thermal Energy Corp. discussed how carbon emissions regulations might impact their respective cogeneration systems and the need for both greater clarity and continued advocacy for reasonable policy treatment for the reduced regional greenhouse gas emissions provided by campus CHP systems.

Sustainability practices have been integrated into university utility operations and are now a primary driver of institutional missions. Both Steve Mischissin of UNR and Gregg Coffin of



Photo: Jerry Newton Photography.

Nearly 430 participants registered for this year’s Campus Energy Conference, including a high percentage of first-time attendees – an encouraging signal of industry activity.



During the opening session, panelists pointed out that new buildings, especially those incorporating laboratories, vivariums and research facilities like UNR's new Davidson Mathematics and Science Center, are creating mission-critical energy loads with heating and cooling characteristics that are different from base campus buildings.

the University of Missouri in Columbia emphasized how future campus buildings are being designed to achieve at least the LEED® (Leadership in Energy and Environmental Design) Silver standard and be 30 percent more energy-efficient than ASHRAE 90.1 – whether or not the institution chooses to proceed with LEED certification.

In addition, fuel-flexible solutions, such as landfill gas at UNC-Chapel Hill and biomass at Mizzou, are being evaluated to help reduce carbon emissions and provide an alternative fuel source at competitive pricing with local economic advantages.

Sustainability practices have been integrated into university utility operations and are now a primary driver of institutional missions.

Technical Tracks

The technical program, organized by Conference Technical Chair Tom Phelps of Stantec, provided detailed case studies presented over two days on such topics as master planning and infrastructure renewal; campus cooling and thermal storage; mission-critical

operations; sustainable fuel options; operations and maintenance; controls, monitoring and metering; and CHP/cogeneration. (For more details, see the proceedings posted at <http://tinyurl.com/2010campus>.)

In addition, Steve Spiwak of Nalco arranged and moderated a panel discussion on dealing with new and emerging emissions regulations for large boiler facilities. Tim Griffin of RMF Engineering also provided a comprehensive update on new guidelines for LEED and district energy, reflecting work he has done with the U.S. Green Building Council on behalf of IDEA. Ryan Reid of UT Austin also contributed to the LEED discussion based on recent activities and experience on his campus.

Early Workshops

Braving travel disruptions and delays due to historic blizzards across the mid-Atlantic region, many IDEA members still attended the two workshops held prior to the conference. The Distribution Forum, co-chaired by Mark Vogler of Citizens Thermal Energy and Bob Manning of Harvard University, held a full-day Distribution Workshop that included in-depth discussions and presentations on steam systems, public safety, maintenance and emergency preparedness. Other presentations centered on maintenance approaches, monitoring

and optimization strategies employed in Copenhagen, and major construction project case studies.

Also that day, IDEA held a parallel workshop on district energy for the U.S. Department of Energy (DOE) Clean Energy Regional Application Centers (RACs). Drawing more than 80 participants, the session provided an introduction to district energy and enabled participant interaction.

John Cuttica and Ted Bronson, program leaders for the DOE RACs, overviewed the mission and capabilities of the eight RACs. IDEA members, including leading consulting firms and campus utility operations leaders, presented a series of discussions on such topics as assessing thermal energy markets, master planning, system optimization, risk management, fuel flexibility, climate action plans, communications and various financing strategies. Going forward, IDEA will continue to support the RACs in developing district energy systems and implementing community-scale CHP systems.

Going forward, IDEA will continue supporting the DOE's Clean Energy Regional Application Centers in developing district energy and community-scale CHP systems.



Photo: Jerry Newton Photography

There was a great turnout for the Distribution Workshop where participants shared their experiences and insight as they discussed the operational challenges of safely managing thermal distribution networks. The Distribution Forum, which sponsored the workshop, is developing a new steam safety training protocol.



Photo: Jerry Newton Photography.

At the conference luncheon, Dr. Bob Gemmer of the U.S. DOE outlined the mission of the U.S. DOE RACs and commended IDEA members for their workshop participation and support.



Photo: Jerry Newton Photography.

Throughout the conference, the sold-out trade show buzzed with activity and facilitated networking between attendees and exhibitors. Once again, IDEA members supported the John Gray Scholarship with contributions and a raffle of a 46-inch HDTV, won by John Andrepont of Cool Solutions Inc.

Kudos to Nevada Hosts

The conference concluded with a well-organized and informative technical tour led by Steve Mischissin and staff from UNR, with stops at their central heating plant and visits to buildings including the new math and science center. IDEA thanks the outstanding personnel at UNR for their participation and gracious hospitality: Greg Battaglia, Dave Del Porto, Don Del Porto, John Freeman, Jeffrey Mikkelsen, Steve Mischissin, John Walsh and Brian Whalen. We also thank Jimmy Oaks and Dean Parker of the Peppermill facilities operation staff, who provided a tour of the new geothermal district energy system and central plant serving the large hotel complex.

EXHIBITORS

IDEA thanks our many exhibitors for their invaluable support and participation.

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(See our valued conference sponsors on next page.)

In summary, many IDEA attendees commented favorably on the quality and content of the conference, expressing confidence in the progress of the industry and the association. Many indicated their excitement about DOE's renewed involvement in the district energy industry and offered ongoing support to advance IDEA's legislative and policy agenda in Washington and congressional districts nationwide.

Prior to the conference, a dedicated group of IDEA outdoor enthusiasts had the opportunity to ski together once again in nearby Lake Tahoe and to continue enjoying the camaraderie and friendship that IDEA offers members from around the world. 🌀



Photo: Jerry Newton Photography.

On Wednesday evening, the attendees enjoyed dinner sponsored by Burns & McDonnell at the National Automobile Museum. Good food and drink were served amid world-class classic and historic automobiles from The Harrah Collection. Here IDEA members Craig and Tony Mirabella check out one of the cars on display.

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Systems to Tap Data Center Heat

District heating systems in London and Helsinki are set to tap heat from local data centers to fuel their systems.

Telehouse West, a new £80 million (\$127 million) state-of-the-art data center in east London, is slated to begin transforming waste heat into district energy for the local Docklands when the facility is completed in early 2010. The 19,000-sq-m (205,000-sq-ft) center will mitigate its carbon footprint by exporting 9 MW of heat generated by racks of servers to heated water that will be piped to more than 1,000 nearby homes and businesses.

The move, which will save up to 1,100 tonnes of carbon dioxide emissions per year, has received approval from the Greater London Authority. The disposal of waste heat from cooling systems is one of the most significant sustainability issues associated with data storage. This will be the first time a heat export strategy has been introduced in the U.K. for this type of data center facility.

A new data center in Helsinki, Finland, built in a former World War II bomb shelter under the city's Uspenski Cathedral, is already helping to heat hundreds of homes. Waste heat generated by the data center's electronic equipment is captured and channeled into the district heating network of Helsingin Energia, the city of Helsinki's energy provider.

The data center was developed jointly by local technology company Academica and Helsingin Energia. At full capacity, the recovered heat is equal to the heating energy required by 500 single-family houses. Helsingin Energia, which also supplies district cooling to the center, foresees opportunities for additional similar facilities in Helsinki.

Mass Flow Meters for Greenhouse Gas Reporting

Sierra Instruments has introduced a line of mass flow meters certified for greenhouse gas reporting. All Sierra

greenhouse gas meters now conform to the new U.S. Environmental Protection Agency rule (40 CFR Part 98), which mandates that as of Jan. 2, 2010, companies in the United States that emit more than 25,000 tons per year of carbon dioxide equivalent must report greenhouse gas emissions.

Sierra's greenhouse gas-certified mass flow meters provide an economical way to totalize ethane or natural gas burned, enabling the calculation of CO₂-equivalent emissions. Sierra has extensive experience in producing highly accurate and repeatable mass flow meters for methane as well as other emissions as called out in the EPA mandate.

To make it easier for customers affected by the rule to find the meter they need, the company has established a dedicated Web site (www.sierrainstruments.com/greenhouse.html) featuring its greenhouse gas-certified mass flow meters. Sierra has also trained its team of flow application and service engineers in the EPA Greenhouse Gas Reporting Rule so they can answer customer questions.

The three thermal mass flow meters on Sierra's greenhouse gas Web page are the Boiler-Trak™, Model 640S and Model 780S. Sierra's Boiler-Trak™ is a thermal mass flow meter designed for stationary combustion applications (commercial boilers, kilns and heaters), which are among the largest CO₂ emitters. To date, more than 15,000 units have been successfully installed.



Sierra's Greenhouse Gas-Certified Mass Flow Meters

CNN Spotlights Honolulu Seawater System

In a Dec. 18 story about renewable energy in Hawaii, CNN's John King featured the \$200 million Honolulu Seawater Air Conditioning (HSAC) project now in the early stages of construction. The project will extract ocean water off Honolulu's shoreline for use in cooling around 40 of the downtown area's largest buildings.

Tom Wilkolak, chief operating officer of HSAC, said that the cost of his company's service will be equal to or less than the cost of electricity, with the added benefit of offsetting about 178,000 barrels of oil per year.

The CNN piece also showcased solar and wind energy and biofuels as part of Hawaii's energy future. To read a transcript of the story or watch the video, go to <http://tinyurl.com/ycckewn>.

Energy Metering to Be Compulsory in Dubai

Dubai Municipality is considering making energy metering compulsory for all new buildings under the Dubai Green Building Regulations, according to a Jan. 3 Emirates Business report. The move is being evaluated, with a final decision on implementation expected within months. It is aimed at reducing energy consumption by offering residents a tangible incentive to cut their usage.

The current regulation draft states that for all new buildings other than villas, which are supplied by a central air-conditioning source such as district cooling, and where cooling energy is delivered individually to several consumers, meters must measure and record chilled-water supply to air-conditioning units.

Once passed, the new regulations will remove the flat-rate-paid-per-square-foot system that allocates cost to residents regardless of consumption.

NRG Energy to Power New Princeton Medical Center

Through its subsidiary NRG Thermal, NRG Energy Inc. has signed a contract to provide "combined heat and power plus"

services to the new University Medical Center of Princeton in Plainsboro, N.J. Currently under construction, the 237-room acute-care hospital is expected to open by the end of 2011.

Under the 13-year contract, NRG will supply the facility with electricity, steam for heating and chilled water for air conditioning, achieved with a thermal energy storage system. Other green elements of the agreement include solar power generation and energy-saving smart meters as well as backup power.

The structural aspects of the CHP system are subject to Plainsboro Township Planning Board approval, since such a power-generating system was not initially part of the Plainsboro site plan approval for the hospital project.

New Apple iPhone/iPod Downloads for Engineers

Multieducator Inc. offers its Formulator series of Apple iPhone apps specially designed, programmed and packaged for a variety of professionals in many fields including civil, environmental, electrical, mechanical and hydraulic engineers. These applications put hundreds of formulas, graphics calculations, federal and state regulatory codes, and industrial code requirements at a user's fingertips.

There are many individual and bundled Formulator packages available. One product, for example, the Building Engineer Pro, combines the formulas of Electrical Pro, Plumbing Pro, HVAC Pro and Carpentry Pro. In addition it includes part of the International Building Code and a broad suite of special formulas for the building engineer.

All programs can be downloaded to an Apple iPhone and iPod Touch and are available at the Apples iTunes Store. For more information, visit www.multieducator.net.

Vancouver System Warms Olympic Village

The city of Vancouver, B.C., 'flipped the switch' Jan. 14 on its first renewable district heating system. The \$30 million system, which uses energy created from

wastewater, heated the Olympic Village and kept 2,800 athletes and officials warm during the 2010 Winter Games. By using a renewable resource to create heat, the Neighbourhood Energy Utility (NEU) system will help Vancouver make progress toward its goal of becoming the greenest city in the world by 2020.

NEU is providing heat and hot water to all buildings in Southeast False Creek, including the Olympic Village, serving up to 16,000 residents and businesses. It is expected to reduce greenhouse gas emissions by more than 50 percent compared to conventional energy sources. The system marks the first time in North America that heat recovered from untreated wastewater is used in an urban center and as the primary energy source. This green technology will be supplemented by solar hot water.

FVB Energy served as the owner's engineer for the energy center and designed the project's distribution system and building connections.

The Canadian government invested CA\$9.47 million (\$8.96 million) in the project through the federal Gas Tax Fund. The Federation of Canadian Municipalities invested CA\$5 million (\$4.73 million) through the Green Municipal Fund. The city of Vancouver is supplying the remainder of funding.



The Neighbourhood Energy Utility plant's flue stacks have been sculptured in the shape of a stainless steel hand. The fingernails, made from LED panels, change color depending on the amount of green energy being used.

The federal Gas Tax Fund is a tripartite agreement between Canada, British Columbia and Union of British Columbia Municipalities (UBCM). It delivers infrastructure funding to local governments for capital projects that lead to cleaner air, cleaner water or reduced greenhouse gas emissions. Through 2014, the fund will provide a total of CA\$1.6 billion (\$1.5 billion) for local infrastructure in British Columbia. UBCM administers the Gas Tax Fund in the province in collaboration with the Canadian and British Columbia governments.

Grand Valley, Veolia Renew Agreement

Veolia Energy North America announced that it has renewed its agreement with Grand Valley State University (GVSU) in Grand Rapids, Mich., to continue providing thermal heating services to the institution's Pew Grand Rapids campus. Since 1998, GVSU has received thermal energy at two locations, Secchia Hall and DeVos Center, via the downtown Grand Rapids district energy system. As part of the three-year contract extension, Veolia Energy will also collaborate with the university to increase its energy efficiency.

Veolia Energy acquired the former Kent County District Heating and Cooling system in November 2008. Since then improvements have been systematically implemented to increase operational efficiency, including the installation of a condensing economizer.

Veolia Energy will also improve GVSU's operations and sustainability by implementing a system that will permit the university to purchase less water and instead reuse condensate as makeup water for its cooling towers.

The company provides approximately 125 commercial, government, institutional and health care customers with district energy services in the Grand Rapids central business district.

Geothermal Heating Developed in China

Geysir Green Energy is developing the Xianyang Geothermal District Heating project in Shaanxi Province, China. The system has replaced coal-burning facilities and been installed in new developments that would otherwise have used coal. The project's first phase was completed in 2006 and is expected to become the largest geothermal district heating system in the world when it expands to serve 15 million sq m (161.5 million sq ft) by 2015.

Today, Shaanxi Green Energy operates five heat centrals and nine geothermal wells with an installed peak-load capacity of 100 MWth and a baseload of 63 MWth. The Xianyang operation offsets 33,000 tons of fossil fuel carbon emissions every year, equivalent to the emissions from 11,000 cars or planting 330,000 trees every year.

Geysir China operations are focused on investing and expanding geothermal developments in the country through Shaanxi Green Energy Geothermal Development Co. Ltd., a joint venture between Enx-China and Sinopec, which is engaged in the development and operation of geothermal resources for district heating systems in Shaanxi and Hebei provinces. The Xianyang geothermal system is Shaanxi Green's first project in Shaanxi Province.

Cyberview to Invest in District Cooling

The Star of Malaysia reported Dec. 16 that Cyberview Sdn Bhd will invest 58 million ringgits (\$16.9 million) over the next two years to expand a district cooling system serving Cyberjaya, a high-tech planned township located around 30 miles south of Kuala Lumpur. Cyberview is a government-owned company and the

landowner of Cyberjaya, considered the Silicon Valley of Malaysia. Cyberview's wholly owned subsidiary Pendinginan Megajana will carry out the cooling system expansion.

At Cyberview's annual media briefing, Managing Director Datuk Redza Rafiq said that the district cooling system expansion will help preserve the environment and lower the cost of doing business in Cyberjaya. He noted that the move supported the prime minister's Budget 2010 goal of developing Cyberjaya and Putrajaya as pioneer townships in green technology. Cyberjaya has submitted a strategic plan and a 'green roadmap' to the government that outlines numerous green initiatives focusing on land, energy, water, waste and recycling, and air quality.

Currently 512 small and medium-scale enterprises, multinationals and local businesses are based in Cyberjaya.



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UAE's Largest Preinsulated Pipe Manufacturing Facility

At a Jan. 20 ceremony, the new Empower-Logstor Insulated Pipes Systems (ELIPS) plant was inaugurated in Jebel Ali, Dubai, United Arab Emirates. Attending the opening were His Royal Highness the Crown Prince Frederik of Denmark and His Highness Sheikh Mansoor Bin Mohammed Bin Rashid Al Maktoum. The plant is the UAE's largest preinsulated pipe manufacturing facility.

ELIPS is a joint venture between Emirates Central Cooling Systems Corp. (Empower) and Logstor, the world's largest manufacturer of preinsulated pipes. The \$25 million facility will cater to the requirements of district cooling services as well as the oil and gas industry across the Middle East.

Through ELIPS, Empower expects to save between 15 percent and 25 percent on the cost of preinsulated pipes for its various projects. The plant should benefit from its location in the Jebel Ali industrial area, which provides easy access to both the Dubai and Abu Dhabi markets.

Florida A&M Going Green With Siemens

Florida A&M University (FAMU) is now on the path to a greener and more sustainable campus for students and faculty. It has signed a new \$2.4 million energy savings performance contract with the Building Technologies Division of Siemens Industry Inc. The company will help the Tallahassee, Fla., campus maximize the energy and resource efficiency of its buildings, improving the environment and reducing energy consumption.

Work has already begun to install pipe insulation, steam trap replacements and lighting upgrades at the campus's central plant. When work concludes in spring 2010, Siemens guarantees energy savings that will provide equivalent cost savings (depending on utility rates during the 10-year contract) of more than \$4.1 million, enough to cover the financing and provide a return on the overall investment. Once implemented, retrofits

and upgrades are calculated to reduce carbon dioxide emissions by 4.5 million pounds annually, equivalent to planting nearly 15 acres of trees.

FAMU is home to 12,274 students. Its campus encompasses 156 buildings and some 3.9 million sq ft.

Stanley Consultants, ClearView Team Up

Stanley Consultants Inc. and ClearView Monitoring Solutions (formerly InSyst Ltd.) have formed a strategic partnership to provide a comprehensive approach to helping university and district energy facilities improve combined heat and power equipment performance and availability. The partnership integrates Stanley's engineering and technical consulting expertise with ClearView's Next Generation asset monitoring software, which provides in-depth visualizations of equipment, plant or unit performance that support improvements in performance, predictive maintenance and early fault detection.

Qatar Cool Marks Fifth Anniversary, Opens Plant

Qatar Cool celebrated its fifth anniversary of operations with a gala dinner Feb. 7. The event recognized the efforts of employees who have assisted in the company's growth; it also included the official inauguration of Qatar Cool's second plant in West Bay, Doha's financial district. The new plant has been operating since January.

At the dinner, Qatar Cool Chairman Omar al-Fardan welcomed guests and outlined the company's achievements as it has grown from a team of three in 2004 to nearly 100 staff members. He thanked the leadership of Qatar for their vision as well as a number of organizations that helped with the establishment of the company.

General Manager Fayad Khatib recounted Qatar Cool's growth to the current total capacity of 67,000 tonnes of cooling at the two West Bay plants. He also noted the company's introduction of

the world's largest cooling plant situated at The Pearl-Qatar, set to be fully opened and operational by the end of the year. When The Pearl-Qatar plant is at capacity, it will produce 130,000 tonnes of cooling.

The chairman of UDC, Hussein Alfardan, was also honored at the dinner, after which he cut the ribbon to open the new West Bay facility. The plant will extend service to an additional 1 million sq m of space (10.8 million sq ft) in the area. The combined West Bay plants will serve a total of 46 towers by 2011, including a mixture of residential, office and mixed-use buildings as well as numerous new hotels that are currently still at construction stage.

The new West Bay plant is Qatar Cool's third facility, the first plant was launched in West Bay in 2006, and The Pearl-Qatar facility began operating in 2009.

Montpelier Wins Federal Energy Grant

As announced in January, the city of Montpelier, Vt., will receive an \$8 million grant for a combined heat and power system that will serve the Capitol complex, City Hall and up to 156 additional downtown buildings. It will be fueled with wood chips harvested locally. By providing 1.8 million kWh of power to the grid, the system will maximize operating efficiency and reduce thermal costs for consumers. The project will be a public-private partnership among the city of Montpelier, Vermont's Department of Buildings and General Services, Veolia Energy and the Biomass Energy Resource Center. The city estimates that 35 total net new jobs will directly and indirectly be created within the project's first year.

Cornell Cuts Coal, Starts Up New CHP Plant

Cornell University in Ithaca, N.Y., celebrated the official opening of its new combined heat and power plant Jan. 15, marking a major milestone in the university's efforts to reduce its carbon footprint and to eliminate coal as an energy source by mid-2011. The occasion was

marked at an event on campus for state and local officials, with remarks from Cornell President David Skorton, New York State Department of Environmental Conservation Commissioner Pete Grannis and Bruce Nilles, director of the Sierra Club's "Beyond Coal" campaign.

Before the 30 MW natural gas-fired plant came on line, Cornell relied primarily on coal to produce steam for heating the campus, burning more than 60,000 tons of coal per year. Since then, however, the university's coal usage has been reduced by 80 percent.

The new plant is part of a larger sustainability initiative at Cornell. This includes the university's Climate Action Plan, which sets a goal of reducing campus net greenhouse gas emissions to zero by 2050.

Summer District Energy Course in Denmark

The Engineering College of Aarhus in Denmark and the Danish Development Centre for District Energy will jointly offer a two-week summer school course on district energy, planned in close cooperation with Danish district energy industry representatives. Set for Aug. 8-20, 2010, the course will include lectures, company visits and an industry case study. It is designed for engineering students who will finish their education within the next year, but young professional engineers with less than one year of experience in the sector may also take part. Almost all expenses (housing, food, travel costs to companies) will be covered by the project and the industry; young engineers pay a fee of 14,400 Danish crowns (\$2,635) to participate. For more information, visit <http://tiny.cc/ihadk>.

Spirax Sarco Introduces MassTracker™ Flow Meter

Spirax Sarco Inc. has introduced the MassTracker™ insertion turbine multivariable flow meter. This instrument combines measurement of mass or volumetric flow, density, temperature and pressure in one instrument. Typical applications include flow monitoring of steam and natural gas



Spirax Sarco's MassTracker Flow Meter

for fiscal or load control, combustion air, flue gas for environmental compliance, heat content calculations for chilled water and measurement of a variety of liquids in line sizes from 3 to 80 inches.

Hot-tapability makes possible installation and service without process shutdown. The MassTracker produces a negligible pressure drop, reducing energy and operating costs. The unit's low-mass rotor design is fabricated from one solid block of stainless steel, with no welded joints. There are six field-installable cartridges with different turbine pitches and National Institute of Standards and Technology traceability. For more information, go to www.spiraxsarco.com/us.

Analysis: Barriers, Enablers to Geothermal District Heating in U.S.

Although the U.S. is rich in geothermal energy resources, there are currently only 21 geothermal district heating systems operating in the U.S. with a total capacity of about 100 MW thermal. The sector's status is analyzed in an article published in the February 2010 issue of the *Energy Policy* journal. Titled "Barriers and enablers to geothermal district heating system development in the U.S." by Hildigunnur H. Thornsteinsson and Jefferson W. Tester, the article also provides policy recommendations for advancing the technology. The article is available through the EconPapers Web site at <http://tinyurl.com/ylc4ghe>.

Excess Costs of Shiftwork Quantified

While there may be inherent necessities and considerable business advantages to running an operation 24 hours a day, there are also downsides and hidden costs that often go unnoticed. Management consulting firm Circadian discusses the excess costs of shiftwork (extended-hours) operations in a new management report, *Financial Opportunities in Extended Hours Operations: Managing Costs, Risks and Liabilities*. According to the report, the incremental cost to employers from the productivity loss, absenteeism, turnover, workplace accidents, and increased insurance and medical costs related to shiftwork is around \$8,600 per shiftworker per year.

The report notes that relative productivity of shiftworkers decreases by 5 percent at night, and excessive overtime is also known to decrease productivity. Shiftworkers are more than twice as likely to be absent from work than daytime-only employees. Absenteeism is highest in facilities reporting severe fatigue problems. The firm notes that turnover rates are three times higher at shiftwork operations than day-only operations, with the cost to recruit and train the average shiftwork employee at more than \$24,000.

Shiftworkers also account for 20 percent more insurance claims and costs than their daytime counterparts. Although shiftworkers account for 10 percent of the insured population, they account for 17 percent of health care costs and are at greater risk for sleep apnea, heart disease, mental health disorders and obesity.

To order Circadian's full report on the excess costs of shiftwork, go to <http://tinyurl.com/ydpe7st>.

U.K. Researchers to Study Heat Capture and Storage

The Web site BusinessGreen.com reported Jan. 20 that the Energy Technologies Institute (ETI) in the U.K. is preparing to announce a number of new research projects to assess the viability of large-scale low-carbon projects. These

would include research into capturing waste heat from power stations and storing it deep underground for use months later by district heating systems.

Smaller-scale gravel-bed heat storage projects have been successful in the past, and ground source heat pump technologies have gained in popularity. Dr. David Clarke, ETI chief executive, noted, however, that underground heat storage has yet to be attempted on the scale being proposed by the ETI project.

Under the proposal, fossil fuel-fired power plants along the U.K.'s east coast could be fitted with heat as well as carbon capture technologies, allowing heated water to be pumped into geological formations beneath the North Sea for use at a later date. Clarke said research would focus on the technical

and economic viability of the system, noting that the cost of building district heating networks to distribute the heated water could prove prohibitive. Still, he argued, such a system has the potential to deliver huge carbon savings for the U.K.

The ETI invested £54 million (\$83.6 million) across 17 research projects last year and expects to invest £70 million (\$108.3 million) across a smaller number of projects in 2010.

Fortum, Russian System Sign Agreement

Fortum's Russian subsidiary OAO Fortum and the Chelyabinsk Region Administration have agreed to collaborate to improve energy efficiency in the region through 2012. According

to a memorandum of intentions signed during Russian Energy Minister Sergey Shmatko's visit to Finland Jan. 28, the parties intend to partner to implement a number of measures aimed at reducing environmental impacts and promoting efficient use of resources. The largest project they will undertake is the automation and upgrade of the Chelyabinsk district heating system, which will reduce energy losses in the area by more than 30 percent and significantly decrease fuel consumption and emissions.

A project this size is unique in Russia and will be partly funded by raising the district heating tariffs controlled by the region's administration. Once the upgrade is completed, consumers will be provided with an uninterrupted and more affordable supply of district heat.

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OAO Fortum General Director Alexander Chuvaev said, "During 2009-2012, we will invest 3 billion rubles (\$99.8 million) in improving energy efficiency. An additional 1.5 billion rubles (approximately \$50 million) for the implementation of the program will be collected from district heating tariffs."

Fortum is also planning to implement a number of technical improvements at power plants in the Chelyabinsk region to increase the efficiency of heat and electricity production. In addition, the company has launched a sustainability program aiming to reduce environmental impacts both around the power plants and in the region as a whole.

Software Further Improving System Performance

Optimum Energy LLC announced Feb. 8 that it has implemented its OptimumHVAC™ software at The University of Texas at Austin (UTA) with results that have exceeded expectations. The energy efficiency software is being used in Chilling Station 6 of UTA's district cooling system – one of four plants within the university's 46,000-ton system serving the campus's 17 million sq ft of building space. Chilling Station 6 was the first 100

percent variable-speed drive plant of this size commissioned by Johnson Controls. With OptimumHVAC, the annual wire-to-water performance range for Chilling Station 6 is expected to be 0.33-0.78 kW/ton, compared to the design performance range of 0.57-0.79 kW/ton. In the first full month of operation, Chilling Station 6 has operated as low as 0.28 kW/ton.

Results from the first 30 days of full operation confirm the plant is on target to meet estimated first-year savings of 6 million kWh for an operating cost reduction of approximately \$500,000. UTA is expected to realize a full return on investment for the incremental cost of the software in just over a year.

OptimumHVAC is a bundled third-generation software solution that includes OptimumLoop control software and OptimumHVAC Performance Assurance services. More information on the software is available at www.optimumenergyhvac.com.

Canadian District Energy Surveyed

The Canadian District Energy Association has published the findings of its latest survey of all known district energy systems within the country. Titled *District*

Energy: A National Survey Report, the document presents a comprehensive picture of the industry with data in 10 key areas: system locations, total building area connected, distribution network length, heat and cooling services, plant commissioned, total installed capacity, total energy sold, fuel type, number of employees and capital investment. The survey database now contains information on 2,253 MW of district energy capacity in Canada and a sufficient number of systems to enable CDEA to continue assessing the industry as it grows across the country. To download the survey report, go to <http://cdea.ca/resources>.

Veolia Energy Acquires Comfort Link

Veolia Energy North America announced Feb. 10 that it has purchased the Baltimore-based Comfort Link district cooling system business. Comfort Link was previously a partnership of Baltimore Gas and Electric, a Constellation Energy subsidiary, and Monumental Investment Corp., a subsidiary of Emcor Group Inc. One of the largest ice thermal storage systems in the country, Comfort Link serves 50 major customers, representing more than 11.5 million sq ft of space. The acquisition will expand



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Veolia Energy's existing district heating and cooling and cogeneration operations in Baltimore, with 16 new buildings served.

Comfort Link's cutting-edge ice thermal storage system reduces the number of required chillers and cooling towers, which makes it highly energy-efficient and environmentally friendly. Comfort Link's energy storage system allows Veolia Energy to produce thermal energy during off-peak periods, potentially saving money and reducing the demand for electricity during peak hours.

Veolia Energy will provide preventive maintenance and will continue to invest in the system to increase efficiency. Customers connected to the system include federal, state and city government buildings; entertainment and retail establishments; commercial office buildings; hotels; hospitals; and religious and other nonprofit facilities.

"In addition to being a valued addition to our growing North American portfolio, the Comfort Link acquisition is the perfect complement to our existing heating and cooling network in Baltimore," said Stewart A. Wood, president and chief executive officer of Veolia Energy North America. "This system was particularly attractive given its high level of energy efficiency and its strong environmental profile, which matches our commitment to ensure that our systems help our customers reduce their carbon footprints. We are committed to providing excellent service to the many high-profile buildings and attractions served by this system, as we collectively work toward a more sustainable Baltimore."

The Comfort Link system delivers more than 32,000 tons of cooling capacity and approximately 40 million ton-hr of chilled water via an 11-mile distribution network. Founded in 1996, the system fea-

tures four networked chilled-water plants. Veolia Energy anticipates future growth for Comfort Link as more buildings in the vicinity leverage the network as a cost-effective, highly reliable and environmentally responsible alternative to operating and maintaining their own thermal energy equipment.

Veolia Energy's Trigen-Baltimore subsidiary provides steam, hot water and chilled water to commercial, government, institutional and hospitality customers in the central business district and Inner Harbor East. Now, with the addition of Comfort Link, Veolia Energy has more buildings to serve and has dramatically increased its total chilled-water capacity.

Sweco to Upgrade Ukrainian System

International consulting group Sweco has signed an agreement worth more than 591,000 euros (approximately \$806,000)

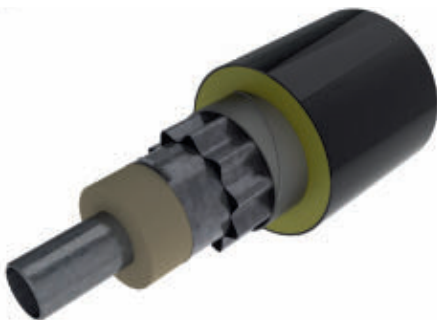


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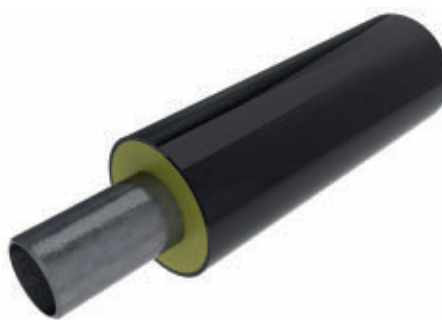
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with the Odessa District Heating Co. in Ukraine to renovate and upgrade the city of Odessa's outdated district heating system. The firm will support the system throughout the modernization process, from development of workflow proposals, procurement of contractors and project supervision to on-site training of staff to operate the district heating network more efficiently. The system upgrade is expected to improve operating efficiency and reduce greenhouse gas emissions. The European Bank for Reconstruction and Development will finance Sweco's contributions.

UAE-U.S. Business Relations Discussed

Ahmad Bin Shafar, chief executive officer of Emirates Central Cooling Corp. (Empower), met in February with the newly appointed U.S. Consul General Justin H. Siberell to discuss ways to foster business relations between the United States and the United Arab Emirates. Robert W. Dunn, principal commercial officer, was also present. The meeting stressed the need for boosting cooperation and exchanging expertise between Empower and U.S. companies engaged in the energy sector in particular and industrial sector in general.

Bin Shafar noted that the UAE is considered one of the world's top places to do business, and U.S. businesses are actively taking part in the UAE's economic boom on all fronts. The American delegation praised the liberal business climate in the UAE, including the emirate of Dubai. Siberell described Dubai as an information technology, tourism, trade and education hub for the entire region.

The meeting sought not only to promote U.S. exports to the UAE, the largest U.S. trading partner in the Middle East, but also aimed to attract investment to the U.S. from the UAE and strengthen two-way trade. According to the U.S. Department of Commerce, air-conditioning and refrigeration equipment is among the most promising prospective U.S. exports to the Middle East.

Green Light for Biomass CHP at N.Y. Business Park

The New York State Public Service Commission in February approved up to \$35 million in financing to build a 9.6 MW biomass-fueled combined heat and power plant at Griffiss Business and Technology Park in Rome, Oneida County. Operated by Griffiss Utility Services Corp., the plant will provide lower-priced electric and steam service to the industrial park tenants.

The CHP facility is sized to meet electric and steam needs at the Griffiss Park. It will supply approximately 75 percent of the park's electric demand and will replace the existing steam boilers, supplanting them as the source for meeting all steam load requirements. The power plant operator will remain interconnected to the national grid to obtain the remaining 25 percent of its electric needs.

Griffiss Utility is a not-for-profit corporation formed in 2000 to assist Griffiss Local Development Corp. (GLDC), operator of the Griffiss Park, fulfill its purpose of promoting economic development in the Rome, N.Y., region. The 3,500-acre complex, which contains approximately 80 buildings and 29 miles of road, formerly operated as a U.S. Air Force base. The closure of most of the base beginning in 1995 adversely affected the regional economy. GLDC was created to operate the Griffiss Park at the base in an effort to promote economic activity that would reverse the adverse effects of the closure.

Electric and steam service at the Griffiss Park is furnished through an electric distribution grid comprised of two substations, numerous transformers, hundreds of miles of underground and overhead transmission and distribution lines, and a steam system comprised of four boilers and 26 miles of underground steam distribution and condensate return piping.

Because it uses biomass as its primary fuel source, the facility will reduce carbon dioxide emissions at the Griffiss Park by approximately 46,000 tons per year. The

purchase of biomass fuel for the plant will also inject approximately \$3.5 million into the local forestry industry.

Victaulic Launches Direct-Groove Two-Piece Coupling

Victaulic has extended its line of patented advanced groove system (AGS) couplings for faster and easier installation of large-diameter piping systems. The line extension means Victaulic now offers rigid and flexible couplings with the AGS technology for pipe sizes up to 60 inches in diameter for industrial process, utility, water and wastewater applications.

A typical large-diameter joint that requires several hours to weld can be installed easily in less than an hour using Victaulic AGS couplings. Victaulic AGS couplings have a two-piece housing and a wedge-shaped groove that delivers pressure ratings up to 350 psi (2,400 kPa), depending on the pipe size and wall thickness. Until now, joining methods for larger-size piping systems required multiple housings to achieve the same results. Victaulic is the only manufacturer to offer a two-piece housing for couplings in this size range.

To further simplify installation, the new larger size AGS coupling housings feature lifting lugs for added convenience when lifting individual housings. AGS couplings also provide a union at every joint for easy access to the piping system for scheduled and unscheduled maintenance and system retrofits. In addition, the coupling allows visual confirmation of proper assembly (assembly is complete when housings are metal-to-metal and



Victaulic AGS Coupling

torque requirements have been met), an added benefit that helps ensure proper assembly.

For more information, visit www.victaulic.com/ags.

UBC Selects Nexterra/ GE Biomass Power System

The University of British Columbia (UBC) and Nexterra Systems Corp. announced Feb. 15 that UBC will install and demonstrate a biomass-fueled combined heat and power system developed by Nexterra and GE Power & Water's gas engine division. The CHP system will be located at UBC's Vancouver campus where it will provide heat and electricity for the campus while offering a platform for bio-energy research.

The new CHP system, the first of its kind in North America, combines Nexterra

gasification and synthetic gas conditioning technologies with a GE high-efficiency Jenbacher gas engine. Woody biomass will be gasified and converted into clean syngas that will be directly fired into a gas engine. The CHP system will be capable of providing very high net efficiencies – up to 65 percent in cogeneration mode. In late January, Nexterra announced it had completed performance testing on its proprietary syngas conditioning technology.

The plant will produce 2 MW of electricity that will offset UBC's existing power consumption. The system will also generate enough steam to displace up to 12 percent of the natural gas that UBC uses for campus heating, thereby reducing greenhouse gas emissions by up to 4,500 tonnes per year. This is the equivalent of taking more than 1,100 cars off the road.

UBC is also collaborating with FPLInnovations to house the CHP system in a building designed and constructed using cross-laminate timber (CLT). CLT is a new solid-wood building material that can be used as a low-carbon, renewable alternative to steel frame construction. This will be one of the first CLT buildings in North America and will demonstrate its market potential for the forest industry.

Funding support is being provided from the following organizations: Government of Canada's Clean Energy Fund administered through Natural Resources Canada, Sustainable Development Technology Canada, the BC Bioenergy Network and FPLInnovations.

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Green Building Council and Booz Allen Hamilton, green building will support or create 7.9 million jobs between 2009 and 2013 and will contribute \$554 billion to the U.S. gross domestic product. The study also determined that green construction spending currently supports more than 2 million American jobs and generates more than \$100 billion in gross domestic product and wages. The full study can be downloaded at www.usgbc.org/greeneconomy.

U.K. Experts Call for More District Heating Support

The U.K. Green Building Council and the Zero-Carbon Hub released a new report Feb. 18 pointing to community solutions as the way forward for building the sustainable infrastructure needed in the U.K. for a low-

carbon future. The report, *Sustainable Community Infrastructure*, highlights district heating as having a key role to play in realizing that future but says that much greater support for the technology is needed from central and local governments. As a starting point, the study calls on governments to commit to signing up their own buildings for district heating service.

In addition to district energy, the study noted that community-scale water systems, waste disposal and waste reuse can also contribute to more sustainable infrastructure. To read the full report, go to <http://tinyurl.com/yhbg44w>.

Colebrook, N.H., Weighs District Heating

The town of Colebrook, N.H., (population 2,300) is considering the

development of district heating as a solution to bring down energy costs and help transform the grim local economy. Local National Public Radio affiliate WRVO aired a story Feb. 19 on the possibility of district heating coming to Colebrook. The report stated that nearly one in four Colebrook residents lacks a full-time job and that local leaders hope more affordable energy could help attract new businesses to the area. The town envisions building a system that would burn low-grade wood fuel from surrounding forests with 90 percent efficiency. Jerry Pittman of NRG Energy Center Minneapolis was quoted in the story, explaining how district energy systems require the density of customer of buildings to be cost-effective. To listen to this radio report, go to WRVO's Web site at <http://tinyurl.com/ydl8bal>.

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Tabreed Wins Aramco Contract

Saudi Tabreed has signed an agreement to develop and operate a district cooling system to cool all the buildings of Saudi Aramco in the Dhahran area. Under the 23-year agreement, Saudi Tabreed will design, construct, finance, own, operate and maintain a centralized cooling plant and a network to supply chilled water to the Saudi Aramco buildings with a cooling capacity of 27,000 tons of refrigeration.

Washington Gas, Honeywell Get D.C. Campus Contract

Washington Gas and Honeywell have been selected by the U.S. General Services Administration (GSA) to jointly design, install and maintain a central utility and cogeneration plant and distribution system at St. Elizabeths West Campus in Washington, D.C. The plant will meet up to 30 percent of the peak energy demand for the campus, which will serve as the headquarters for the U.S. Department of Homeland Security (DHS) headquarters as well as its agencies – the U.S. Coast Guard, Federal Emergency Management Agency, Immigration and Customs Enforcement, Customs and Border Protection and Transportation Security Administration.

The new plant will improve energy security, minimize stress on the local electrical grid and reduce greenhouse gas emissions. It will also allow the department to focus more resources on fulfilling its mission of keeping the country safe and secure.

The central plant will give GSA the flexibility to support the energy needs of DHS through on-site generation that will deliver nearly 25 MW of electricity for the 4.5 million-sq-ft campus that is scheduled to be completed by 2016. The plant and distribution systems will provide thermal utilities, chilled and hot water, electrical services, and normal and emergency power for DHS and its agencies.

The new plant is expected to reduce emissions by more than 50,000 metric tons of carbon dioxide equivalent. According to figures from the U.S.

Environmental Protection Agency (EPA), this is comparable to removing nearly 10,000 cars from the road.

Financing First for District Cooling

Eastern District Cooling, a wholly owned subsidiary of Zamil Industrial Investment Co., has signed the first non-recourse project financing in the Gulf region with the National Commercial Bank (NCB) for a district cooling project. NCB acted as sole mandated lead arranger for a 13.5-year Murabaha facility (an Islamic financing structure) for an amount of 206 million Saudi Arabian riyals (\$54.9 million). The sponsors will bring the remaining amount as equity. The project is being developed by Energy Central Co. and advised by Gulf International Bank (GIB).

The loan agreement was signed in Dammam Jan. 27 by Abdulla Al Zamil, chief executive officer of Zamil Industrial, and Mansoor Durrani, head of project finance for NCB, in the presence of Khalil Issa, chief executive officer of Energy Central, and other representatives from Zamil Industrial, NCB and GIB.

Dalkia to Build Biomass CHP Plants in France

Dalkia has been selected for seven projects as part of the French government's third call for tenders for combined heat and power plants fired by biomass. The projects will enable more than 570,000 tonnes of biomass to be recovered annually, mainly in the form of forest residue, and the total electricity generating capacity will be close to 60 MW.

Dalkia is to build, provide with feedstock and operate the seven new biomass-fired CHP plants, which will supply renewable heat to district heating networks and generate electricity. The biggest of the plants, which will have a capacity of 10 MW of electricity and 33 MW of heat, will be connected to the Rennes district heating network and will heat more than 15,000 housing units.

Six other plants, with electricity capacities ranging from 7.5 MW to

10 MW, will supply the existing district heating networks in Strasbourg, Orléans, Tours, Angers, Lens and Limoges.

More than three-quarters of the 570,000 tonnes of biomass that will feed the seven new plants will come directly from forests, in line with Dalkia's feedstock strategy. Feedstock provision will be organized in partnership with local forestry participants, including landowners, logging companies and forestry maintenance companies.

Funding Committed for Possible Guelph System

The Federation of Canadian Municipalities has awarded a Green Municipal Fund grant of CA\$145,750 (\$138,000) for a feasibility study of a district energy system proposed in Guelph, Ont. The system would provide heating, cooling and electricity at three sites: Guelph General Hospital, the downtown core and the University of Guelph.

As part of the study, Guelph Hydro Inc. and Union Gas Ltd., in partnership with the city of Guelph, will examine various sources of renewable energy and the use of an upgraded waste-derived fuel in the form of pellets from landfills to supply a district energy system. The study also will explore other options for increasing energy efficiency and use lifecycle analysis to evaluate the environmental and social impacts of each option. The final study report will include draft designs, preliminary cost estimates and implementation schedules, and it will address required regulatory approvals.

If the proposed district energy system is feasible, it could become a model for other mid-sized communities in Canada with a long-term vision for the use of renewable energy and energy conservation.

Tabreed Reports on Finances, Financing

National Central Cooling Company PJSC ('Tabreed'), the Abu Dhabi-based utility company, released its unaudited 2009 year-end financial results in early March. The results revealed that for the 12 months ended Dec. 31, 2009, total

revenues were AED 742 million (\$202 million) – a slight increase over 2008 figures. Tabreed's gross profit was AED 291 million (\$79 million) in 2009. After finance costs, however, results from associated companies, a non-cash impairment charge and other items, Tabreed recorded a loss of AED 1,118 million (\$304 million) for the year. This compares with a profit of AED 73 million (\$20 million) in 2008.

Due to the challenges facing Tabreed, the board of directors appointed a new management team in mid-2009 comprised of utility sector experts. Based on a comprehensive review of the company, the management team recommended, and the board of directors approved

- declaring a non-cash impairment charge of AED 1,161 million for 2009 to reflect the long-term value of projects in light of the current difficult economic climate; and
- a short-term financing facility from Mubadala Development Company PJSC of AED 1.3 billion to provide funding while Tabreed completes the recapitalization program. As part of the recapitalization program, this senior-debt financing will be available until the end of 2010 and may be converted to long-term capital.

The board also approved submitting to the shareholders a recapitalization plan to achieve a stable long-term financial profile and capital structure, the elements of which include entering into discussions with strategic investors to provide long-term capital necessary to support the development of the business.

EU Lends China Money for Energy Efficiency

The European Investment Bank (EIB) is lending China 134 million euros (\$182 million) to support four projects aimed at improving energy efficiency and mitigating climate change. A 31 million-euro (\$42 million) share of the loan will support a new hot water district heating system in Jinan, the capital of Shandong Province. The project, which will move the operation from steam supply to hot water supply

and improve automation, is expected to reduce heat losses and electricity consumption by nearly half and to cut water use by 16 percent.

The other three projects included in the loan – all in different provinces – involve installing solar-power lighting, building small-scale hydropower plants and constructing a chemicals plant that will use waste energy. When all four projects are operational, an estimated 830,000 tons of carbon dioxide emissions will be avoided every year.

St. Paul System Eyes Expansion

As reported March 3 in the *Pioneer Press*, District Energy St. Paul is hoping to capitalize on the construction of a light-rail line along University Avenue as an opportunity to expand the company's district heating network. As part of the project, District Energy also proposes to capture and reuse waste heat from the Rock Tenn recycling plant in the western part of St. Paul. The heat currently being rejected from the plant is considered enough to serve all of University Avenue.

Construction has already begun on the approximately \$1 billion Central Corridor light-rail line, which will link downtown St. Paul and downtown Minneapolis. Installing heating pipes at the same time as crews lay the train tracks would reduce excavation costs by around 40 percent, creating a "once-in-a-lifetime opportunity for the city and the community to reduce its carbon footprint," according to District Energy CEO Anders Rydaker.

District Energy and the light-rail project technical staff are currently studying how the project could be carried out in the limited space along the avenue. Although the necessary agreements and funding are not yet in place, the company is optimistic that the expansion project can become a reality. The project cost is likely to be between \$25 million and \$30 million. 

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In Remembrance

Richard P. Garrison, owner of Garrison Design, served as art director of *District Energy* magazine from 1997 to 2009. He passed away unexpectedly in February at the age of 58. Dick had a passion for his craft – and for the mission of IDEA. He often commented that he found it fulfilling to work for an organization that was doing such important things to promote energy efficiency and environmental responsibility.

Dick started his graphic design business in 1986 and provided design services for many organizations in the district energy industry. His family and friends knew him as a “man of art and music.” He excelled at drawing detailed pencil sketches of family members, and he had been a drummer as long as anyone can remember.

At the age of 13, Dick was the drummer for a band that once opened for B.B. King. Over the past decade he had formed a new rock band that played gigs in Minneapolis and St. Paul. Although the band hadn’t played in some years, early this past January they had gotten together to practice, ready to start gigging once again. He also had a passion for dogs – not just his own, but others as well.

Dick will be missed. We are grateful for his service to IDEA and the district energy industry. Donations in Dick’s memory may be made to the Animal Humane Society in Golden Valley, Minn., at www.animalhumanesociety.org.



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People In the News

Sebesta Blomberg has promoted **Stephen Halsted, Glin Jay and Randolph Thompson** to executive vice president and **Randy Lorenz, Dave Harrison, Tom Schubbe, Nathan Germolus, Maryam Peters, Abbe Bjorklund, Bob Riesselman and Bob Barker** to vice president. Sebesta Blomberg provides engineering and consulting services to education, government, health care, industrial, transportation and utility market segments. It is headquartered in Minneapolis-St. Paul, with more than 15 offices throughout the United States.

Burns & McDonnell, a full-service engineering, architecture, construction, environmental and consulting solutions firm, recently formed an OnSite Energy & Power Group and hired national and regional practice leaders to enhance its diversified experience in large campus energy and power projects.

Scott Clark, PE, CEM, joins Burns & McDonnell as the national OnSite Energy & Power practice leader.

In his more than 20 years of experience, Clark has planned and designed energy and power projects for higher education, healthcare and aviation clients. His experience includes master planning, central plant optimization, thermal storage distribution and project development. In 2008, he received the energy manager of the year award from the Association of Energy Engineers – Region IV. He is a registered professional engineer in Texas and holds a sustainability development professional certification from AEE.

Tom Parker, PE, joins Burns & McDonnell as the OnSite Energy & Power eastern region director. He brings 25 years of experience designing and managing large energy and power projects in the higher education, healthcare and aviation industries. His



experience includes master planning, central plant optimization, combined heat and power, and distribution. Parker is a member of AEE and a registered professional engineer in Massachusetts, Alabama, North Carolina, Virginia, Tennessee and Georgia.

Jon Schwartz, PE, CEM, LEED® AP, joins Burns & McDonnell as the OnSite Energy & Power central

region director. With 15 years of experience in utility infrastructure planning and design, his expertise lies primarily in energy planning and efficiency projects for healthcare facilities, universities and airports. His experience includes master planning, central plant optimization, thermal storage, distribution, and energy analysis and auditing. In 2004, Schwartz received the energy engineer of the year award from AEE – Region IV. He is a member of AEE and the American Society of Heating, Refrigerating and Air-Conditioning Engineers. Schwartz is a registered professional engineer in Oklahoma and Texas and is also a certified green building engineer and certified sustainability development professional.



The board of directors of Svensk Fjärrvärme (Swedish District Heating Association) has appointed **Peter Dahl** as

acting director effective Feb. 3, until a new director is named.

Dahl has held various positions within the association, most recently serving as deputy director and marketing manager. He has been with the association since 1998. His role has included providing support for new district heating system operations, developing customer quality assurance programs and responding to questions related to industry regulation. The former director, Lena Somwestad, left the association to run for parliament.



The Canadian District Energy Association (CDEA) has named **Mary Ellen Richardson**

as acting president. Richardson is currently working with Queen's University as a Fellow of the Institute of Energy and Environmental Policy. Her 28-year career in the oil, natural gas and electricity industries has included roles in marketing and sales to residential, business and industrial customers in Canada and the U.S., as well as executive and operating responsibility for legal and regulatory affairs, facilitation, market planning, stakeholder management, public relations and government liaison activities. Richardson was previously with the Ontario Power Authority, most recently as executive adviser providing strategic support and counsel to the chief executive officer and executive team. She was formerly president of the Association of Major Power Consumers in Ontario and held roles at Ontario Hydro, Enbridge Consumers Gas, TransCanada PipeLines and Petro Canada. She has also served on numerous energy industry boards and committees. Richardson holds an honors degree in economics.



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Regulators Are People Too: Approach them like that

Alan I. Robbins, Esq., Jennings, Strouss & Salmon, PLC

Editor's Note: "From a Legal Perspective" is one of the newest column additions to District Energy magazine. It appears in each edition to address legal issues of current importance to the district energy industry. It is intended for educational purposes only and does not constitute legal advice. Robbins is a colleague of IDEA's legal counsel, Joel Greene.

Know your audience. That applies to your favorite regulatory agency, too. To know your audience, you need to try to understand what is driving them. What are their policy objectives? How do those policy objectives apply to your company or your particular regulatory proceeding? How can you make their jobs easier and enable them to declare success, while at the same time achieving an acceptable outcome for you? What are the specific roles, responsibilities and biases of the individuals you are dealing with?

You undoubtedly address these and other similar questions when developing a new marketing plan, a new advertising campaign or new promotional materials. You should promote your regulatory objectives in a similar manner.

Know what you want, and why.

Identify your objective clearly. Do so before you start or become involved in the regulatory process. Understand whether your primary interest is in a dollar outcome or, instead, in the setting of policy or precedent. If your interest is a matter of dollars, then you presumably have flexibility in how you achieve or package that result. But, if your objective is grounded in policy or principle, then you must decide the extent to which you need to remain true to that philosophy.

Know how what you want fits or conflicts with known regulatory policy or regulatory objectives.

Understand the mindset of your regulators. Their policies and policy objectives will color the glasses through which they examine your proposal. When possible, present your position as one that is consistent with their policies or that furthers their policy objectives. Even when what you want is at odds with their policy, it is often more effective to say "I really want to get on board with your policy, but I can't unless you change [X] because otherwise I will suffer this terrible consequence, which surely is not what you

policy is intended to cause," than it is to say "I object to your policy because it's bad policy."

Remember, even if you don't like their policy or it doesn't work for your company, the regulators likely helped formulate that policy. They therefore are not likely to think and will not admit that it is bad policy. Telling them that you think it is bad policy will only cause them to become defensive, not receptive. Just as you would not tell parents that you think their child is ugly, but might ask if they ever considered having the child sport a different hair style – so too should you suggest some tweaking of policy rather than directly deriding the policy.

Explaining pertinent differences between district energy and other regulated utilities to which the policy applies will likely provide you the springboard for this approach. Explain why you are different and why that means some change to the policy is necessary when applied to you. Most regulators recognize that one size does not always fit all, but sometimes you have to first make clear that not everyone is the same size.

Establish and maintain credibility.

Credibility is essential. Do not come into a regulatory proceeding ill-prepared. Know your objective, know your issues and know the basis for each. Know where your position is supported by existing practice or policy and where it departs from it. Be able to explain why. Be able to explain what the significance is to both you and to the public. Have a clear, understandable and not overly detailed explanation of your position, but also be ready to back it up with as much detail and support as is available.

Know where your position is supported by existing practice or policy and where it departs from it. Be able to explain why.

The regulators' job is to balance the interests of the regulated company and the interests of the consumers or the public at large. Help them do that. Address not only your needs and interests, but the consumers' and public's interests as well.

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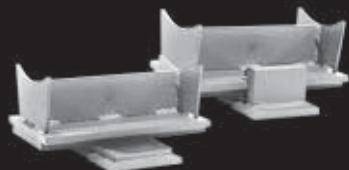
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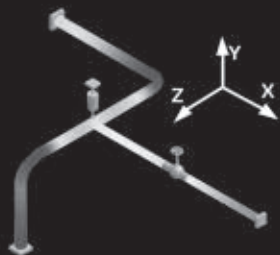
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Don't be afraid, but be respectful.

Regardless of what you think of the individuals involved, approach them politely, respectfully and as professionals. Speaking pedantically, or otherwise causing them to take offense, will only cause them to become defensive and determined to not agree with your position. Your mission is to achieve your regulatory objective, not to give the individuals a personal reason to be belligerent toward you or your position.

Conduct prefilings educational meetings.

When possible, and assuming that the rules governing your particular regulatory agency allow, meet with them before you file your case. In most cases, the "ex parte" rules prohibit you from unilaterally discussing your case with decision-making individuals at the regulatory agency outside the presence of other parties. But such rules often do not apply until you have filed your case. Discussing a draft of your proposed application in advance of filing is often permitted. If so, such discussions not only afford you an opportunity to 'heads up' and educate the regulators, but also to get some initial feedback. Getting such feedback can be invaluable. It can prompt you to modify your filing before you make it, so that you fashion it in a manner that is more likely to address the regulators' concerns.

Garner customer support. The more widely supported your position, the easier it is for the regulators to

approve it. Do what you reasonably can to obtain support, or at least non-objection, from your customers. You will have to deal with your customers' views once you make your filing, so why not try to do so *before* you file, thereby smoothing out some of the bumps in the regulatory path that you are likely to confront later on?

Always keep in mind that 'the regulators' are, like you, people with a job to do. Understand the job of the agency, and understand the jobs and roles of the individuals with whom you are dealing. Most people appreciate being treated respectfully even if they disagree with your opinion or position. Be respectful by being prepared, professional and aware of their views and responsibilities. 

Alan Robbins is a Member of Jennings Strouss & Salmon PLC. Based in the firm's Washington, D.C., office, he is engaged in the firm's energy and regulatory practice. He has extensive experience representing clients before the Federal Energy Regulatory Commission and other federal and state agencies and commissions. He may be reached by email at arobbins@jsslaw.com.



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Reporting From Reno:

Discussions reflect both frustration and hope

Tim Griffin, PE, LEED AP, IDEA USGBC Liaison

Editor's Note: "LEED® + District Energy" is a quarterly column providing information about the U.S. Green Building Council's LEED rating system and how it applies to buildings served by district energy systems.

IDEA's 23rd Annual Campus Energy Conference is now in the books, and what a conference it was. Campus leaders from around the country turned out to share ideas, learn about best practices and capture new strategies to use on their campuses. With the economy in a prolonged downturn, I would have bet that attendance would be light and questions about the LEED program would be low on people's radar screens. With tighter capital budgets, why would campuses still be investing additional funds to pursue LEED certifications for their new and existing facilities? Good thing I did not put any money on either of those bets because I was wrong on both counts!

For one, attendance was strong. Many campus energy leaders came to find out ways to better respond to shrinking utility budgets. I noticed much interest in presentations related to operational efficiencies and a renewed focus on finding ways to position campus energy systems for the future.

On the second count, LEED was much higher on everyone's agenda than any previous campus energy conference. In fact, the topic came up during the opening plenary panel discussion when an attendee posed a question about LEED to the panel. This single question opened the floodgates of discussion. Side discussions continued throughout the conference, ending with a well-attended, hour-long combined session devoted to the subject and continuing ever since via email.

Whether or not you were able to join us in Reno, you may be interested in just a few of the questions and answers that came up frequently during discussions.

Q: New and Improved Version 2.0: Where is it?

A: Throughout 2009, IDEA worked closely with the U.S. Green Building Council (USGBC) to develop a new guidance document to address the specifics of applying the LEED guidelines to buildings that were connected to district energy. While there is an existing guidance document available and in force today, this guidance is difficult to follow and does not address many of the system options available to district energy operators. In addition, it often puts district energy systems on an uneven and unfair playing field when compared to building standalone systems.

IDEA's efforts last year ended in a much improved district energy guidance document that puts district energy on a level playing field. In fact, last quarter's column (first quarter 2010, p. 62) highlights many of the improvements the new guidance document will have over the old. Unfortunately the document still has not been released. The original release date was anticipated to be October 2009, which would have paralleled the release of LEED 2009, the latest new and existing building rating system. Instead, the new district energy guidance document is still 'tied up in committee,' in this case awaiting final approval from USGBC's Energy and Atmosphere Technical Advisory Committee. So designers are still required to use the existing guidance document with all its inherent flaws until the new and improved guidance document is released to the public.

Q: Aren't people only doing LEED for 'feel-good' reasons?

A: Ah, if I had a \$5 chip for each time I heard this during the week, I could have spent a fair amount of time at the blackjack tables. Why are people pursuing LEED certification for their buildings? Surely it makes sense if you can charge a premium lease rate on your downtown office facility, or even if you are a Fortune 500 company that needs to show it is a good corporate citizen. However, what does it do for a campus? Well, the answer may surprise you, but it would not surprise your campus admission departments.



A survey released in summer 2009 by The Princeton Review showed that nearly 20 percent of high school students are strongly influenced by a college's environmental commitment.

Colleges and universities are selling services just like any business. For them, attracting today's best and brightest students is essential to helping them attract the best and brightest tomorrow. Success leads to more success. The higher the demand for our classroom seats, the more ability institutions have to charge premium prices. The business model has not changed for generations. What have changed, however, are their clients' preferences. The best and brightest kids coming out of our nation's high schools are very concerned about the impact their decisions will have on the environment. "What's my carbon footprint?" is something the millennial generation wants to know. These students are considering the 'greenness' of a campus in their college selection decisions, and LEED is the brand that means green! Whether we like it or not, having LEED facilities on your campus is one of the easiest ways to convince potential students you are serious about sustainability.

Q: True or false? We follow LEED standards, but don't pay for the certification.

A: Really??? I don't know how many campus leaders have made this statement to me, but in my experience it is seldom, if ever, true. In our business, we understand building design and construction is always about tradeoffs. When designing a LEED project, inevitably budget comes into play. When it does, tradeoffs have to be made:

"I have a fifth floor or a geothermal system, but I can't afford both." "Do I want to pay extra for products with certified wood, or put that money into extra parking?" I have found consistently that the fear of losing LEED points is the only thing preventing the more 'practical' choice. Right or wrong, I would bet there are few, if any, owners that would make the same choice if they were pursuing the vague target of achieving LEED goals rather than the concrete target of securing LEED certification.

Q: Can't I just publish the efficiency numbers for my plant?

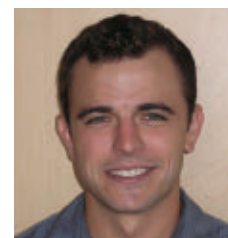
A: This question refers to providing the information a designer needs to determine if a building connected to your district energy system meets LEED requirements. The answer to the question is 'no' and if that is all you do, be prepared for a lot of phone calls and requests for information from building design engineers. The designer needs the following information:

- average monthly efficiency of your campus chilling, heating and electric generation (if CHP), and associated thermal distribution efficiencies
- average cost of all fuels used in the district energy system
- statement that the campus is CFC free or has taken another approach to meeting the CFC requirement (see next quarter's column for details)
- summary of your system's enhanced refrigerant calculations

- statement regarding compliance with commissioning requirements (see third quarter 2009 column, p. 74, for details)

Overwhelmed? I understand why. So where do you start? Here's a suggestion: IDEA member Ryan Reid, assistant manager of plant engineering at The University of Texas at Austin, has put together an excellent Web page providing, in easy-to-follow language, all the information a designer on his campus would need to know about UT-Austin's plant. Check it out at www.utexas.edu/utilities/sustainability/leed/. It is laid out in a language designers understand and provides easy access to the information they require.

In addition, Ryan has included all LEED guidelines related to district energy so designers, who may be unfamiliar with that aspect of LEED, can educate themselves. If you collect the same information on your campus systems and make it available on your campus Web site, designers will have easy access to the information, and you will have one source to update data as your district energy systems grow and evolve. If you do not have the internal resources to do so, there are consultants within IDEA that can help.



Ryan Reid from The University of Texas, Austin, has developed a Web page about LEED that could be a useful model for all campuses to follow.

Q: Can anyone explain LEED's CHP guidelines?

A: This is certainly a tall order, but IDEA is also leading in this effort. The new district energy guidelines include specific methodology for CHP within a district energy system. However, it is so confusing that even the USGBC's district energy work group had difficulty understanding how it was applied. That's where we came in. IDEA has developed a 'guidance to the new guidance' document whose goal is to explain application of the guidance document in easy to understand language. So far it's working. In fact, this guideline was used effectively by USGBC to explain CHP guidance to the committee. Now that's progress!

Where Things Stand

Conference presentations and conversations revealed that a high level of frustration still exists among our members when it comes to LEED. I admit that it is frustrating in many ways. Where did this organization, which we had never really heard of until 5 to 10 years ago, come from, and why is it exerting so much influence on our campuses and in this organization? Doesn't it know that IDEA has been around for more than 100 years? The answer to that question is 'no.' In fact, until a few years ago, it had never even heard of us.

In the midst of the discussion, Tom Nyquist, one of the conference panelists who is the director of facilities engineering at Princeton University, made this statement, which I have paraphrased: "It's easy to think about what the USGBC has done as an annoyance to campus district energy operators, but

we often overlook the positive effects. Ten years ago, when architects came onto our campuses to tell us what they could do, the words 'energy efficiency' were not even part of their vocabulary. Today, no architect comes to Princeton without first talking about how they can design energy-efficient facilities. This is a good thing. It has increased the value of what we as campus energy managers do on campus and has raised the value of the energy discussion."

Tom nailed it. The USGBC wants to drive more sustainable facilities, and IDEA can help. Moving forward I'm excited about what our two organizations can do together.

I'm glad I did not make those bets on conference attendance and the volume of LEED discussion. I did make one good bet though: On my last evening in Reno I spent 10 minutes at a 25-cent poker machine – the only gambling I did all week. On what I had already decided

was my last deal, I hit the jackpot and walked away with \$1,000 – icing on the cake for a great conference. 

Tim Griffin, PE, LEED,

AP is IDEA's liaison with the U.S. Green Building Council. He is a principal and branch manager with RMF Engineering Inc., a firm specializing in district energy system design and commissioning. A registered engineer and a LEED Accredited Professional, Griffin has a bachelor of science degree in mechanical engineering from North Carolina State University and a master of business administration degree from Colorado State University. He authored the book *Winning With Millennials: How to Attract, Retain, and Empower Today's Generation of Design Professionals*. He may be reached at tgriffin@rmf.com.





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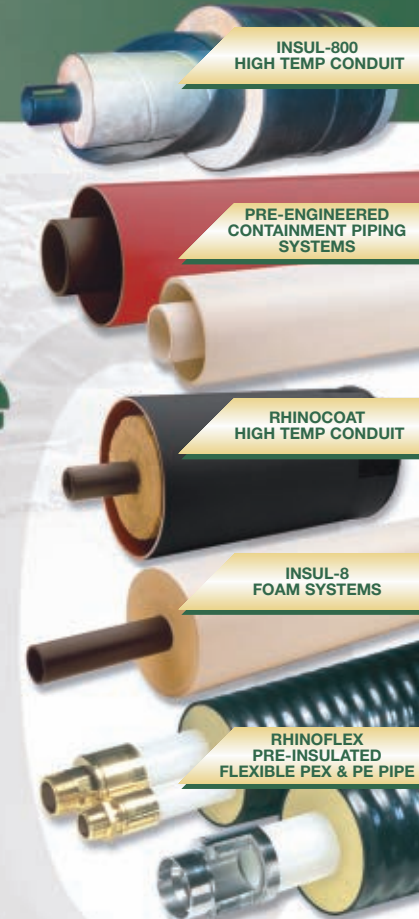
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Magnetic Couplings: A peachy 'new' flavor for ASDs?

Steve Tredinnick, PE, Vice President of Energy Services, Syska Hennessy Group

Editor's Note: "Inside Insights" is a column designed to address ongoing issues of interest to building owners, managers and operating engineers who use district energy services.

Spring has just arrived, and with summer on the way, my thoughts turn to days at the beach, brats on the grill and a cold brewski in hand – or perhaps a more G-rated treat, like a good, old-fashioned ice cream cone. Speaking of which, have you ever tried Cherry Garcia or Peachy Paterno (the latter vended at the Penn State Creamery in honor of my alma mater's beloved football coach)? They happen to be my favorites, both tasty alternatives to plain vanilla – kind of like magnetic couplings in lieu of a variable-speed drive.

Allow me to explain: In these tough economic times when we are all looking to pinch pennies or stretch the few that we have, there may be opportunities to do so right before our eyes, but we miss them. One example is adding an adjustable-speed drive (ASD) to a pump or fan motor to reduce electrical consumption at part load. Varying the speed of a pump or fan takes advantage of the affinity laws where power is proportional to the cube of the shaft speed.

In these tough economic times we are all looking to pinch pennies or stretch the few that we have.

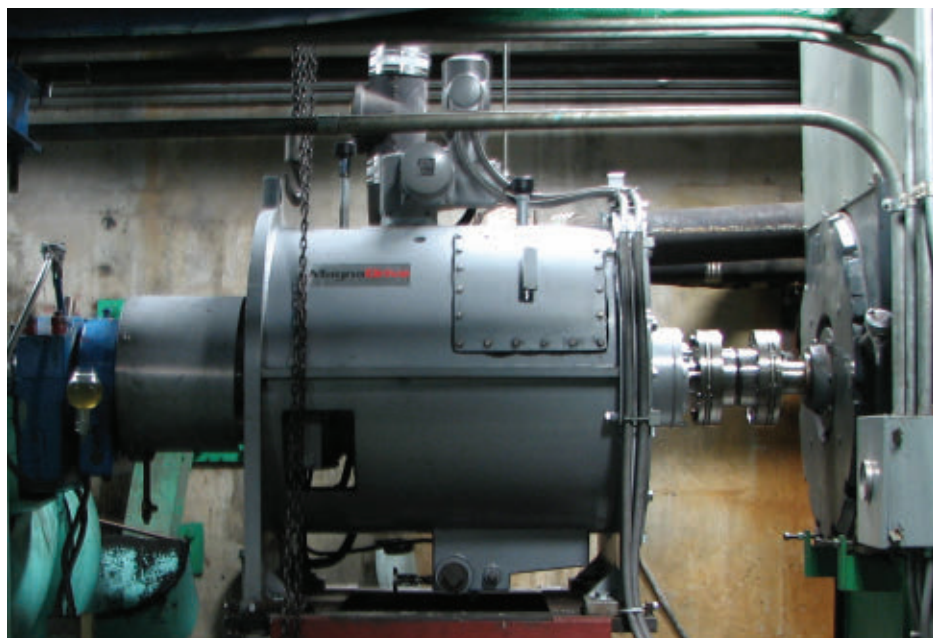
ASDs come in two flavors: those that cause the motor to rotate at varying speeds and those that act as a clutch to introduce slip in the system. The majority of ASDs are variable-frequency drives (VFDs), which by definition use electronics to vary the frequency of the alternating current to the motor, thereby varying the motor speed – pretty much the vanilla flavor. For a more exciting twist, there are the ASDs that keep the motor speed constant and are more mechanical-drive than electronic. These are more the Peachy Paterno-variety ASDs.

Variety and Savings

One such ASD class is magnetically coupled ASDs (MC-ASDs), which have no physical connection between the motor shaft and the load portion of the shaft. For those of you who are old enough to remember: The MC-ASD is sort of an updated version of the Eddy-current clutch of years gone by. A change in the air gap between the magnetic surface and magnets offers precise torque transfer and therefore speed control from 0 percent to 100 percent of the load.

The MC-ASD has two rotor plates mounted on drive shafts separated by an air gap. A high-energy rare earth magnetic rotor is mounted on the load (pump or fan impellor) side and a conductor rotor on the motor side. Similar to the magnetic effect that microbrews have on me (like a carrot on a stick to a horse, or a ring in a bull's nose), the two rotor plates interact with one another. The closer they are together, the stronger the attraction and the less slip; hence, more torque is transferred magnetically from the constant-speed motor to the variable-speed pump shaft.

Conversely, the farther away, the more slip, the less torque is transmitted, and the load side slows down. The magnetic coupling is nonenergized, but motive force is required to move the two plates back and forth – typically an electric or pneumatic actuator.



At the University of Wisconsin-Madison's Charter Street Heating Plant, a MagnaDrive magnetic coupling is used as an adjustable speed drive on a 1,000 HP, 4,160 volt chilled-water distribution pump.

Photo: Steve Tredinnick

Currently, only one manufacturer I am familiar with offers this MC-ASD technology – MagnaDrive. The company was founded in 1999 and has more than 5,000 installations. The drives can be mounted in configurations that are vertical or horizontal, indoor or outdoor, and from 5 HP to more than 5,000 HP. Talk about variety!

I first ran across MagnaDrives at the Charter Street Heating Plant on the University of Wisconsin-Madison campus, where I was performing a plant survey as part of a utilities master plan effort. The company's MC-ASD was installed on a 1,000 HP distribution pump and was stated to be more economical to install than a 4,160 volt VFD. The facility staff swore by this drive.

My reintroduction to MagnaDrives came last year as we were looking for an alternate solution to a 4,160 volt VFD for use on a 500 HP vertical turbine pump. It really saved the day since we did not have the space for the medium-voltage VFD (9.8-ft long by 3-ft wide by 7-ft high); it also offered operational savings.

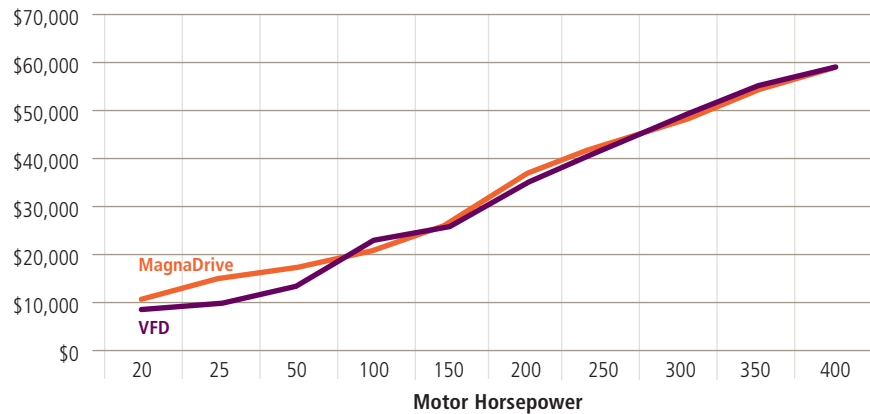
Pros and Cons

From my research, it appears that there are similar operating efficiencies between MC-ASDs and VFDs. A test comparing these drives was performed by Pacific Northwest National Laboratory as part of the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy, and results were documented in a June 2002 report (*Technology Demonstration: Magnetically-Coupled Adjustable Speed Drive Systems*; DOE Contract DE-AC06-76RL01830). The test found that MC-ASDs were 2 percent to 4 percent more efficient in the 80 percent to 100 percent of full-speed range than traditional VFDs. However, they were substantially less efficient in lower-speed (less than 50 percent) ranges and similar in efficiencies in the mid-ranges.

Lower efficiencies at the slower speeds are explained by the fact that the coupling produces more slip at these RPMs, since the rotors are farther apart. So the winner of the efficiency battle really depends on where you will be operating the pump or fan the majority of the year.

Furthermore, as shown in figure 1, MC-ASDs and VFDs have similar installa-

Figure 1. Installation Costs of MagnaDrive Adjustable-Speed Drive vs. Variable-Frequency Drive Motors.



Source: Steve Tredinnick, Syska Hennessy Group, compiled with pricing from vendors and means cost data published by Reed Construction Data.

tion costs, especially exceeding 50 HP. The MagnaDrive has a tremendous advantage over VFDs based on the fact that standard motors can be used and National Electrical Manufacturers Association B motors rated for VFDs don't have to be used. Typically there is at least a 30 percent premium for inverter-rated motors. This is especially important when considering a retrofit installation since a new motor is not required; however, this motor cost savings for the MC-ASD option is not reflected in figure 1, since it represents only the drive installation costs.

MC-ASDs have the following further advantages over traditional VFDs:

- easy to install for new and retrofit projects (no electrician needed)
- similar energy savings to VFDs due to pump affinity laws
- conserve space
- still offer soft-starting characteristics and reduced inrush current
- greater tolerance for motor misalignment
- motor always stays cool since operating at full speed
- minimal impact on power quality and no issues in creating harmonics
- can react better to poor existing power quality as well as power spikes
- simple design and may prove more durable in the long term
- should be compliant with utility energy-saving incentives
- can be installed indoors and outdoors without any special considerations
- typical life span between 15 and 30 years

Some drawbacks to MC-ASDs:

- more expensive in smaller sizes
- less efficient at lower speeds

- electromagnetic interference is a factor if the unit is disassembled
- not much is known about them in the industry

The sweet spot for using MC-ASDs is on larger pump and fan retrofits where one does not want to change out the motor to achieve operational savings of varying the pump or fan speed. One further note is that warranties typically are for two years, and MagnaDrives require some bearing lubrication every 40,000 hours of operation, but that can be done on the same schedule as motor lubrications.

So if you have some existing motors that are more than 50 HP, and you are looking for another flavor to spice up your energy conservation efforts, take a peek at MC-ASDs. The kilowatt-hour savings they offer can be absolutely peachy! 🍑

Based in Madison, Wis., **Steve Tredinnick, PE**, is vice president of energy services for Syska Hennessy Group, which has more than 16 locations across the U.S. He has more than 26 years' experience related to building heating, ventilation and air-conditioning systems. The past 15 years of his work have been focused on district energy systems. Tredinnick is a graduate of Pennsylvania State University with a degree in architectural engineering. He is a member of IDEA and ASHRAE and is currently immediate past chair of ASHRAE TC 6.2 District Energy. Tredinnick currently serves on IDEA's board of directors. He may be reached at stredinnick@syska.com.



Global Warming: Bad for district energy?

David W. Wade, PE, President, RDA Engineering, Inc.

Editor's Note: "Members Speak Out" runs in each issue of District Energy magazine. Its purpose is for a member to briefly share his/her district energy experiences and opinions – and obtain feedback from fellow members. Please email comments to David Wade at dww@rdaeng.com

Yes, the way the United States sees global warming and reacts is bad for district energy. Many readers will disagree, saying that district energy, coupled with combined heat and power, can double fuel use efficiency and greatly reduce greenhouse gas emissions. They will point to European countries where CHP is embraced while increasing reliance on fuels like coal. They also will point to successful university and hospital CHP projects. Of course, new CHP projects are reducing greenhouse gas emissions. Those of us in this industry know that and are proud of the contributions we have made. The problem is one of perception and knowledge by the general public and our politicians.

District energy piping is underground where it is out of sight and out of mind. Even when we construct a new CHP plant, which reduces carbon emissions, the picture the public sees is a large power plant that is still emitting 'something' from its stacks. The electric industry's high-voltage distribution lines crisscross the country and are highly vis-

ible to everyone. Gigantic wind turbines connected to these lines move majestically as they sit atop the pristine prairie emitting nothing, giving the public the sense that global warming is being reversed with machinery that has no emissions. Photovoltaics, likewise, appears to be just another dark roof surface with the added benefit of producing electricity with less environmental impact.

Even when we construct a new CHP plant, the picture the public sees is a large power plant still emitting 'something' from its stacks.

The way the news media presents global warming and the public's general understanding of the required response to the problem say we must immediately stop all emissions by adopting technologies like wind, solar and nuclear energy. The general public has little understanding of the magnitude of the world's energy requirements and that district energy and CHP are logical steps toward a better energy future. The public and news media's focus on global warming has unleashed powerful voices calling for adoption of what can be most

expensive and seemingly least-polluting of all electric generation possibilities. The response from politicians has been to subsidize these technologies regardless of cost and without full consideration of their life-cycle benefits.

There are no massive subsidies or construction programs to help the district energy industry build pipelines, and no dollars-per-Btu credit available for waste heat recovered from industrial or CHP projects. The only bright spot is that tax exempt bonding can be used to construct district energy distribution systems, subject to state caps on total tax-exempt bonding.

There also is no recognition that a district energy system can be fuel-independent for future decades and can use waste heat from CHP plants, municipal garbage incineration, industrial processes or even nuclear power plants. Alas, these arguments are all too familiar.

The district energy industry will not turn public opinion around overnight. Our best hope is to continue to educate the public on the benefits of district energy and CHP, emphasizing the economics and energy efficiency aspects and publicizing other parts of the world where this approach is an integral part of energy supply schemes. We should also educate state utility regulators on the benefits of CHP (see "From a Legal Perspective" column in this issue) and how utility companies must be required to justify why CHP is not implemented. No capacity additions at plants remote from homes and businesses should be allowed without fully justifying the reasons CHP has not been implemented at all available heat users.

The other effort we must undertake is to build allies from related industries. U.S. steel pipe producers and utility contractors would benefit greatly from support of district heating and cooling. Solid-fuel producers would benefit by selling coal to central stations that are serving district energy systems. Even nuclear power could benefit, especially

The district energy industry will not turn public opinion around overnight.

the small modular reactors being promoted that have the ability to locate near electric load centers. These would be conducive to using waste heat from electricity production for heating and cooling.

IDEA has made a good start with its educational campaigns and the district energy video. It is up to all of us, though, to promote our industry as part of the long-term solution to everyone's environmental concerns. 

David W. Wade, PE,

is president of RDA Engineering Inc. in Atlanta and has been an IDEA member for more than 25 years. He has served on IDEA's board and is a past chair of ASHRAE's national technical committees dealing with building steam and hot water systems and district heating and cooling. Wade may be reached at dww@rdaeng.com.



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- Supporting a district energy/CHP program with the US Department of Energy
- Seeking robust federal appropriations to fund industry development
- Linking with international partners to build global industry knowledge
- Expanding markets for IDEA members with the US Department of Commerce

At this critical juncture in the energy/climate debate, IDEA is committed to advancing the interests of all of our members.

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Portfolio Standards: Status and implications for district energy

Mark Spurr, IDEA Legislative Director

Amid the uncertainty regarding energy and climate policy in the United States, one trend is gaining strength: standards that require electricity and (less commonly) natural gas utilities to obtain a certain percentage of their requirements from renewable energy and/or energy efficiency. Various called “portfolio standards,” “renewable portfolio standards,” “renewable energy standards,”

“energy efficiency resource standards” or “clean energy standards,” these policies will affect district energy systems in the coming years, in both positive and negative ways. Portfolio standards have the potential to benefit district energy systems by creating an economic value for combined heat and power. On the other hand, at least in the near term, they will increase electricity prices.

How Do Portfolio Standards Work?

Utilities can meet portfolio standard requirements in a number of ways. Although there are variations, most programs usually include the following options for utilities to meet their renewable energy requirements:

- Construct their own renewable energy facilities.
- Buy renewable energy credits (RECs) in the credit-trading program authorized in the legislation establishing the standard.
- Pay a set “buyout” rate per kilowatt-hour or term of natural gas to help fund programs promoting renewable energy.

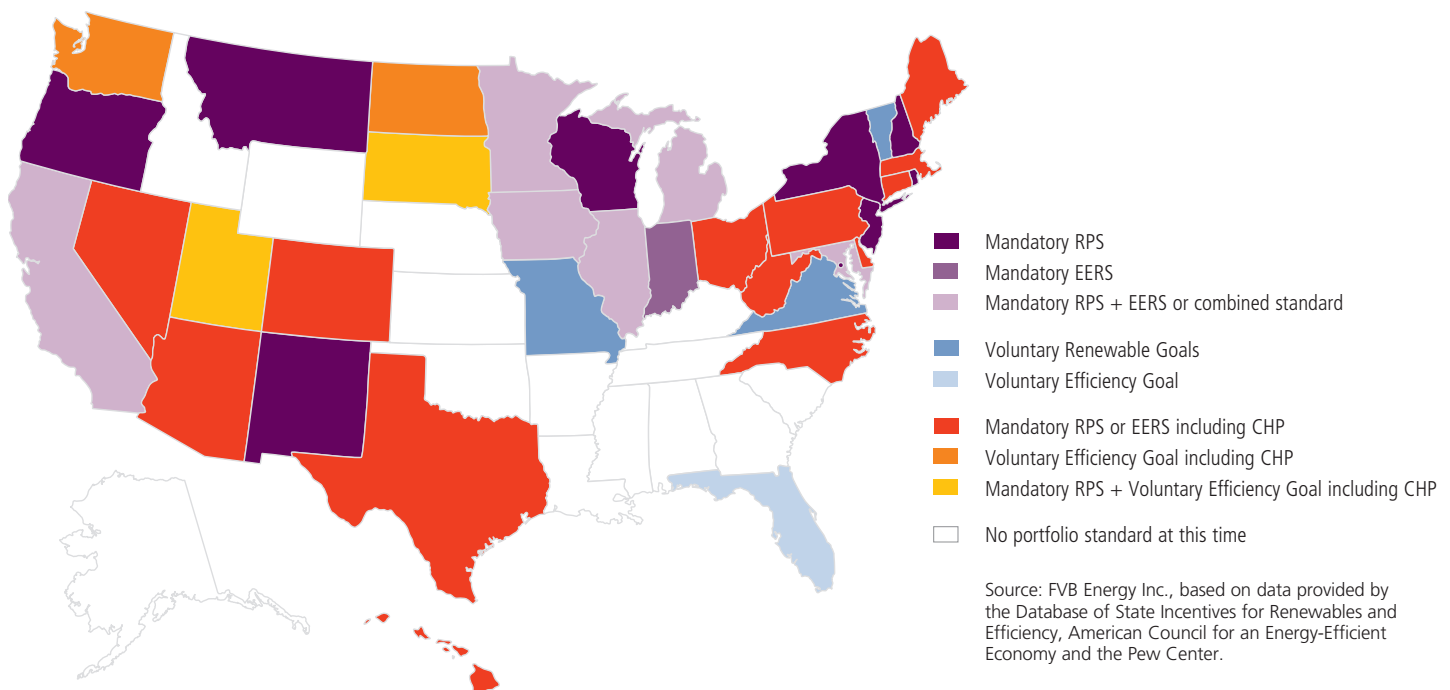
Similarly, to meet energy efficiency standards, utilities have the following options:

- Implement end-use efficiency programs for utility customers.
- Improve distribution system efficiency.
- Pay a “buyout” rate.
- Buy tradeable energy efficiency credits.
- Purchase energy savings through contracts with other utilities, third-party efficiency service providers or other third-party entities.

States Lead the Way

Chances are good that your state has one or more of these standards, as illustrated in figure 1. Thirty states have a mandatory renewable portfolio standard (RPS),

Figure 1. State Portfolio Standards and Combined Heat and Power.



which requires that a growing percentage of electricity sold by retail electric utilities comes from renewable sources. Another three states have voluntary RPS goals.

In addition, 22 states have enacted energy savings goals or energy-efficiency resource standards (EERS). Similar to an RPS, an EERS requires that electric utilities meet a growing percentage of their requirements through efficiency. Twenty states have a mandatory EERS, and five states are in the process of enacting an EERS.

Of importance for district energy systems is that 13 states include CHP in their mandatory portfolio standards, and another four include CHP in voluntary goals. For example, Michigan’s Public Act 295 requires utilities to generate 10 percent of their retail electricity sales from renewable energy resources by 2015. The standard allows utilities to use CHP and other “energy optimization” or “advanced cleaner energy system” credits to meet a limited portion of the requirement. Pennsylvania’s Alternative Energy Portfolio Standard requires that electric utilities obtain 18 percent of supplies using “alternative energy” resources by 2020. Of this total 2020 requirement, 8 percent must come from Tier I sources such as solar, wind and biomass, and 10 percent must come from Tier II sources, which include CHP.

Thirteen states include CHP in their mandatory portfolio standards, and another four include CHP in voluntary goals.

Federal Portfolio Standards

In recent years a number of bills have been introduced in the U.S. Congress to establish federal portfolio standards. IDEA and its allies have argued that a federal standard should include efficiency measures, particularly CHP, in such a standard. These arguments have been successful in that recently introduced legislation has incorporated such provisions.

For example, the American Clean Energy Leadership Act of 2009 (S.1462), sponsored by Sen. Jeff Bingaman, D-N.M., requires that the percentage of electricity

coming from renewable or efficiency source reach 12 percent by 2020 and 15 percent starting in 2021. Of the total clean energy, up to 25 percent can come from efficiency measures, including CHP. The Clean Energy Act of 2009, a discussion draft being circulated by Sen. Lindsey Graham, R-S.C., would require 20 percent clean energy by 2020 and 50 percent by 2050.

Both bills qualify CHP as an efficiency measure with the same language: “Under regulations promulgated by the Secretary (of Energy), the increment of electricity output of a new combined heat and power system that is attributable to the higher efficiency of the combined system (as compared to the efficiency of separate production of the electric and thermal outputs) shall be considered electricity savings under this subsection.”

What does this mean? Over the years of IDEA’s participation in negotiations on incorporating CHP in portfolio standards, a wide range of approaches to legislative language have been debated. Some parties advocated that we count all of the electricity output of fossil-fueled CHP as “renewable.” That position is hard to defend, because although such CHP is far more efficient than separate heat and power, it still requires consumption of fossil fuels. IDEA supported draft provisions that provided a fairly clear and specific calculation methodology to determine

the creditable portion of CHP output. However, there was concern that these detailed provisions were too complicated to be understood and supported, and that consequently inclusion of CHP might be endangered.

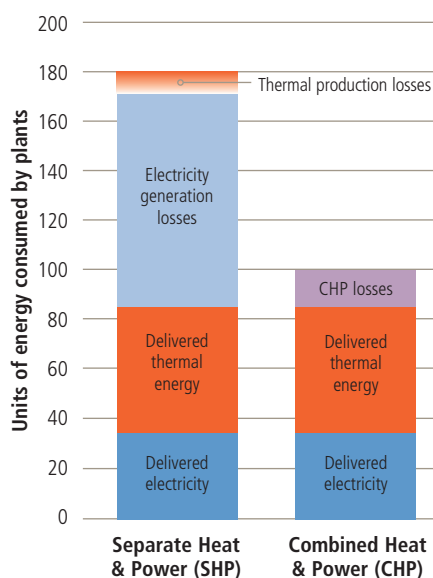
The identical CHP provisions in the Bingaman and Graham bills punt the specific treatment of CHP to rulemaking by the secretary of energy. However, following the years of negotiations on this issue, the American Council for an Energy-Efficient Economy published a paper on the issue in 2009, *CHP Savings and Avoided Emissions in Portfolio Standards*, which I believe should, and likely will, be the fundamental framework in an eventual rulemaking.

The proposed methodology can be illustrated with the following example. Figure 2 compares fuel consumption for a generalized CHP system to fuel consumed by separate heat and power. Both approaches result in the same amount of useful delivered energy: 35 units of electricity and 50 units of thermal energy. CHP requires only 100 units of fuel, whereas separate heat and power requires 180 units. Thus, CHP produces 0.85 units of useful energy per unit of fuel produced, whereas for separate heat and power this ratio is 0.47. The creditable CHP output under the proposed federal portfolio standards for this generalized example, using

Table 1. Creditable CHP Output Under Proposed Federal Portfolio Standards Using Recommended Methodology (sample calculation).

Parameter	Symbol	Energy Units
Delivered electricity	D _E	35
Delivered thermal energy	D _{TH}	50
Electricity generation losses	L _E	86
Thermal production losses	L _{TH}	9
Total CHP fuel	FTOT _{CHP}	100
CHP fuel attributable to thermal	FT _{CHP}	D _{TH} + L _{TH} = 59
CHP fuel attributable to electricity	FE _{CHP}	FTOT _{CHP} - FT _{CHP} = 41
SHP fuel attributable to electricity	FE _{SHP}	D _E + L _E = 121
Creditable CHP electricity output		= D _E x [1 - (FE _{CHP} /FE _{SHP})] = 35 x [1 - (41 / 121)] = 23
Ratio of creditable CHP power to total output		= 23 / 35 = 0.66

Figure 2. Sample Calculation of the Efficiency of Combined Heat and Power vs. Separate Heat and Power.



Source: FVB Energy Inc., based on Elliott, et al, *CHP Savings and Avoided Emissions in Portfolio Standards*, 2009 ACEEE Summer Study on Energy Efficiency in Industry.

the recommended methodology, can be calculated as shown in table 1.

It is extremely important to note that this is only one sample calculation. There are many variations not only in CHP configurations (affecting CHP efficiency and power to heat ratio) but also in power pool characteristics (affecting the efficiency of generation, transmission and distribution of grid power).

Making a Good Idea Better

We have come a long way in expanding the congressional portfolio standard discussion to include CHP. The two federal portfolio standard bills discussed above

would be major steps forward. These bills would even stronger in moving the U.S. to renewable energy if 'renewable negawatt-hours' were made eligible for energy-efficiency credits (EECs). (I suggest EECs rather than RECs because such renewable thermal facilities would function like an efficiency measure, reducing requirements for grid power rather than providing a *supply* of renewable *power* to the grid.)

Renewable energy can be used to produce thermal energy (heating or cooling) that would otherwise be provided with electricity, thereby displacing grid power in the same way as an efficiency measure. For example, solar energy can be used to produce chilled water, thereby avoiding the generation, transmission, distribution and consumption of electricity for conventional air conditioning. Another example would be displacement of electric heating with heat produced with biomass, landfill gas, solar energy or other renewable resources.

By including renewable negawatt-hours, a portfolio standard can encourage additional creative energy solutions that are every bit as effective in stimulating use of renewable energy as renewable power generation technologies.

District Energy Implications

Many district energy systems can benefit from existing state portfolio standards and proposed federal standards. All these standards provide an economic incentive to install renewable power generation, usually by specifically enabling nonutility entities to receive RECs regardless of whether the electricity is transmitted over the interstate transmission system. A major opportunity for district energy systems results from

existing state portfolio standards that allow CHP to qualify as an electricity efficiency measure. Both federal bills discussed above would enable a nonutility entity to receive EECs as long as that entity implemented the CHP and the utility did not pay a "substantial portion" of the cost. It is also notable that both bills provide credits for both power generation and *thermal* output from *biomass* CHP.

Portfolio standards hold the potential for a net positive impact for district systems – a large benefit from implementation of CHP and/or renewable power generation that more than outweighs the potential negative impact of higher electricity prices resulting from implementation of such standards. If you operate a district energy system, I strongly urge you to explore how to take full advantage of the benefits of portfolio standards. 

Mark Spurr is legislative director of IDEA. He also is president of FVB Energy Inc., a U.S. consulting firm specializing in district energy and CHP business development, engineering and marketing. FVB has offices in Minneapolis, Minn.; Seattle, Wash.; Manama, Bahrain; Edmonton, Toronto and Vancouver, Canada; and in Stockholm, Västerås and other cities in Sweden. Spurr represents the United States on the executive committee of the International Energy Agency Implementing Agreement on District Heating and Cooling, including Implementation of CHP. He may be reached at mspurr@fvbenergy.com.



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Customer Closeup

Legg Mason Tower's Sustainable Design Embodies Baltimore's Waterfront Revitalization

Baltimore-based global asset management firm Legg Mason moved into its new corporate headquarters in the Legg Mason Tower skyscraper in summer 2009. The sleek, modern and sustainable structure is part of the new Harbor East development that reflects the city's waterfront urban revitalization and has redefined Baltimore's downtown area. With views of the harbor and the surrounding promenade, the 24-story tower, designed by HKS Hill Glazier Studio with Beatty Harvey Coco Architects as the architect of record, and developed by H&S Properties Development Corp., stands 350-ft tall and is a customer of Veolia Energy's Trigen Inner Harbor business unit.

The 70-acre Harbor East neighborhood extends into Baltimore's harbor, bridging the Inner Harbor and Fells Point. Legg Mason's premier waterfront tower contains 660,000 gross sq ft of commercial office space, including 20,000 sq ft of retail and restaurant space. While Legg Mason occupies three quarters of the building's commercial space, other occupants include, or will include, Hogan and Hartson LLP, Oppenheimer & Co. Inc., Patrick Sutton Homes and Harbor East Marina. Additionally, the John Hopkins University Carey School of Business will be relocating to the Legg Mason Tower as it looks to double its space in the wake of launching a full-time MBA program. The tower is connected to the adjacent Four Seasons Hotel and Residences, a 44-story waterfront hotel and residences, scheduled to open in 2011.

The Legg Mason Tower is designed to meet LEED Gold standards.

The Legg Mason Tower features a sustainable design that sets the standard for environmental excellence in Baltimore. The entire complex has been precertified by the U.S. Green Building Council as LEED® Silver compliant in its LEED (Leadership in Energy and Environmental Design) standards, while the Legg Mason Tower is designed to meet LEED Gold standards. Conceived with efficiency in mind, the Legg Mason office space reflects a sustainable open-office work environment. Work stations are located near the windows, maximizing natural sunlight, while individual offices are located in the middle of the space. Not only does this design increase the environmental efficiency of the building, but it also has been proven to improve employee productivity.

In another step toward a more environmentally accountable future, H&S Properties Development Corp entered into an energy



Courtesy Harbor East Management.

Designed by California's HKS Hill Glazier Studio and developed by H&S Properties Development Corp., the Legg Mason Tower is a crowning jewel of Baltimore's harbor and serves as a model of sustainability for the city.

provision contract with Veolia Energy North America, through its local operating company, Trigen Inner Harbor East. Under the 20-plus-year agreement, Veolia Energy, a leading provider of sustainable energy services and facility operations and management solutions, will provide sustainable heating and cooling services to the Legg Mason Tower.

Through the partnership, the Legg Mason Tower is served by Veolia Energy's Baltimore district energy system, which increases the overall building energy efficiency. District energy plays an integral role in Baltimore's infrastructure, where Veolia Energy serves hundreds of prominent commercial, government, institutional and hospitality customers. Veolia Energy's heating and cooling systems provide centrally produced steam, hot water and chilled water to the Legg Mason Tower and central business district, as well as East Baltimore and the Inner Harbor East. In addition, 50 percent of the steam delivered to customers is produced by renewable fuel that originates from a waste-to-energy facility.

For more information about the Legg Mason Tower or Veolia Energy North America's district energy, cogeneration and facility operations and management solutions, please contact Rowan Sanders at rsanders@veoliaenergyna.com.

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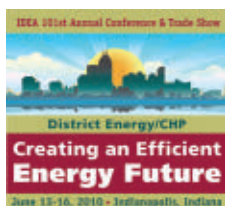
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Contact: www.elmia.se/en/worldbioenergy

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Contact: heidi.juhler@ebl.no

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Palais des congrès de Montréal
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Annual Meeting
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**District Energy/CHP 2012:
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Hyatt Regency Chicago
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Hosted by Thermal Chicago**

**District Energy/CHP 2013:
104th Annual Conference & Trade Show
June 23-26, 2013
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- 5.11.10** Advertising material deadline District Energy Onsite for 101st Annual Conference
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- 5.21.10** Hotel reservation deadline for 101st Annual Conference
- 6.03.10** Advertising space deadline 3rd quarter magazine
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