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gravitate
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Micro CHP
offers reliable,
cost-effective
energy



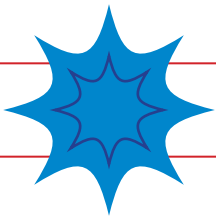


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Always On

CHP provides ideal solution for 24/7 operations.

BY TONYA MCMURRAY

With three shifts operating around-the-clock, large manufacturing facilities need a near-constant supply of reliable electricity.

“Anybody that operates all the time and consumes a lot of energy is a perfect candidate for combined heat and power [CHP] systems,” said Jeff Beiter, managing partner, E-Finity Distributed Generation LLC, the exclusive Capstone Turbine Corp. distributor for the mid-Atlantic and Southeastern United States.

“Most industrial facilities can use thermal energy as well,” he added. “So instead of just buying natural gas, putting it in a boiler and making hot water or steam, you put it into a turbine and you get electricity along with hot water, chilled water or steam.”

CHP systems allow a facility to generate electricity on-site and then capture waste heat generated during the process to provide steam or hot water that can be used for industrial processes, space heating and cooling.

“That is the economic advantage of combined heat and power,” said Paolo Paglialunga, sales manager, power generation, Siemens Canada Ltd. “In most cases, CHP makes sense for industries both from a financial standpoint and also from a greenhouse gas emissions point of view.”

In areas where electric power plants use coal and gas to generate electricity, CHP can result in a significant reduction in a company’s greenhouse gas emissions,

Paglialunga said. The capture of waste heat brings CHP system efficiencies close to 90% compared to about 40% from electricity generation at a typical coal power plant or 56% to 60% at combined cycle gas plants.

He said the combination of resiliency, energy efficiency and cost savings along with low maintenance costs translates into low lifecycle costs for CHP systems, which increase the benefits to manufacturing facilities.

COST AND ENERGY SAVINGS

Higher efficiency and cost-effectiveness were key selling points for a recent Siemens Canada deal with Inter Pipeline Ltd. to provide two industrial gas turbine generators at a Central Utilities Block in the Heartland Petrochemical Complex under



Inter Pipeline Ltd. will install two Siemens SGT-800 industrial gas-turbine generators to supply power and steam for use in its production processes at a Central Utilities Block in the Heartland Petrochemical Complex scheduled to open in late 2021 in Fort Saskatchewan, Alberta, Canada.

PHOTO COURTESY OF SIEMENS CANADA LTD.

PHOTO COURTESY OF E-FINITY DISTRIBUTED GENERATION LLC.



Benz Research and Development Corp. uses the Capstone C200S microturbine for a combined cooling, heat and power system (CCHP) that provides clean and reliable power while saving the company about \$60,000 a year in energy costs.

construction near Fort Saskatchewan in Alberta, Canada. With commercial operation expected to begin in late 2021, the CHP system will supply power and steam for production of polypropylene used in plastics for consumer products.

The reliability and energy efficiency of CHP was also important to Benz Research and Development Corp., a leader in research, development and manufacturing of optical polymers and associated technology used worldwide for contact lens and interocular lenses.

Benz Research uses a combined cooling, heat and power (CCHP) system to generate on-site electricity and recover the waste heat for plant heating and powering two 30-ton, hot-water-fired absorption chillers for the heating, ventilation and air conditioning system. The company first installed CCHP technology more than 10 years ago and has seen excellent results in terms of both energy and cost savings, said Rakesh Vasant, manager, plant operations, Benz Research and Development.

In April 2019, the company turned to E-Finity to upgrade its Capstone CCHP

system to keep up with manufacturing growth.

Benz Research's CCHP system produces an additional 60 refrigeration tons of space cooling with no carbon emissions, offsetting 70 kilowatts of electrical power, boosting overall thermal efficiency to more than 75%, and saving about \$60,000 a year, Vasant said.

"Benz Research has always been environmentally conscious," he added. "By using CCHP, we not only reduce our purchase of 'dirty' utility power, but we also recover the exhaust waste heat and energy for useful purposes and, thus, reduce our carbon footprint and avoid heating up the atmosphere further."

With the upgrade to new Capstone microturbines, Benz Research also expanded its use of the CCHP system to garner even more savings. Previously, the company used CCHP to offset peak electricity rates, but with the upgrade, Benz Research negotiated favorable rates for natural gas from TECO Peoples Gas and Infinite Energy Inc., and it is evaluating the cost-benefit of keeping its system running 24 hours a day.

NO POWER OUTAGES

For most manufacturing facilities, reliability is as important as cost and energy savings. Power outages can result in major disruptions to manufacturing facilities, but CHP systems continue to generate electricity even when the power grid experiences a significant outage due to weather or other problems.

With CHP, facilities can continue operation even if it takes days or weeks for the electric grid to reestablish full power generation, E-Finity's Beiter said.

As a medical device manufacturer with strict quality and regulatory standards, that resiliency is critical for Benz Research.

"Owing to our location in the hurricane-prone state of Florida and the

lightning capital of the world, achieving power resiliency was especially challenging for Benz Research until we turned to Capstone for our on-site power generation," Vasant said.

The system also features easy maintenance as it has only one moving part with no spark plugs, oil or antifreeze, Beiter said.

"Anybody that operates all the time and consumes a lot of energy is a perfect candidate for combined heat and power systems ... Instead of just buying natural gas and putting it in a boiler and making hot water or steam, you put it into a turbine and you get electricity along with the hot water, chilled water or steam."
— Jeff Beiter, E-Finity Distributed Generation LLC

"Our first planned maintenance cycle is at 8,000 hours," he said. "If you turn it on January 1, you don't have to shut it down until Thanksgiving. And then one person can do all the maintenance within an hour or two. Then, you turn it on and wait for another year." **CHP**



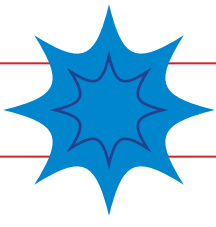
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Understanding CHP:
www.understandingchp.com

Capstone Turbine Corp.:
www.capstoneturbine.com

Siemens Canada Ltd.:
<https://new.siemens.com/ca/en.html>





Reviving The Riverside

CHP brings affordable and efficient hot water and electricity to renovated hotel.

BY TONYA MCMURRAY

When David and Lynda Johnson, along with local partners, purchased The Riverside Hotel in 2011, the Boise, Idaho, market’s largest hotel had fallen into disrepair.

“It was a neglected 50-year-old hotel owned by an out-of-state company that needed some local love,” said David Johnson.

With a focus on local music, customer service and the creation of a resort atmosphere in an attractive location, the Johnsons have invested in multiple renovations and improvements to turn The

Riverside Hotel into one of the area’s highest-rated hotels.

Among those improvements is a new combined heat and power (CHP) system offering cost-effective electricity, heat and hot water for the 300-room property, which has 22,000 square feet of meeting space.

HIGH-PRICED ELECTRICITY

“When we purchased this property, I was stunned at the high electric bills,” Johnson said. “So, the CHP solution started there, with an electricity usage problem. Our boilers were also very old and needed to be replaced. CHP provided a solution to both problems.”

The hotel considered just purchasing new boilers and replacing lightbulbs with LED lights to reduce electrical costs, but local energy consultants recommended CHP instead.

PHOTO COURTESY OF THE RIVERSIDE HOTEL



The Riverside Hotel — the largest in the Boise, Idaho, market — installed a new combined heat and power (CHP) system offering cost-effective and energy-efficient generation of electricity, heat and hot water as part of its renovation of the 300-room property.

PHOTO COURTESY OF 2G ENERGY INC.



The 2G Energy 400-kilowatt CHP system provided The Riverside Hotel a robust solution for high electric bills and aging boilers. The CHP system meets 76% of on-site thermal needs and 88% of the hotel's electrical needs, providing annual utility savings of more than \$190,000.

CHP is a great solution for hotels because it provides consistent thermal and electrical needs, said Dave Swenson, manager, industrial services, Intermountain Gas Co.

"If you have steady electrical and thermal requirements, the CHP engine is very efficient," he said. "Riverside also wanted to replace old boilers, so it was a good fit and good timing."

A COMPLETE SOLUTION

In 2017, The Riverside Hotel installed a 2G Energy 400-kilowatt CHP system. It provides hot water for laundry, showers, guest-room heat, and the outdoor pool and spa while also generating electricity.

The CHP efficiency is about 82% at full load and meets 76% of the on-site thermal requirements and 88% of electrical needs, said Emily Robertson, marketing manager, 2G Energy Inc.

"With the CHP in place, the hotel is enjoying more reliable electricity and hot water as well as an annual utility

savings of more than \$190,000 and an estimated return on investment of 4.3 years," she said.

CHP technology has also reduced the hotel's carbon emissions by 2,194 metric tons, the equivalent of removing 463 cars from the road, Robertson said.

CHP systems are also a win for gas utilities, Swenson said. It creates more consistent gas usage throughout the year as less expensive gas replaces higher-priced electricity.

An added benefit for the hotel is that the CHP system is more reliable and not affected by power outages that could have a negative impact on guests or hotel activities, Robertson said. **CHP**



For more information about combined heat and power (CHP), visit:

Understanding CHP:
www.understandingchp.com

2G Energy Inc.: www.2g-energy.com



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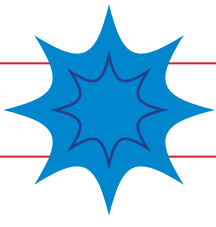


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Backup Power	Heat Storage
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Steam Production	Island Mode

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Game-changer

Universities, schools and prisons are among institutions adopting CHP.

BY DREW ROBB

More and more, educational and other institutions are turning to combined heat and power (CHP). Two significant drivers are project economics and environmental responsibility, said Juan Ontiveros,

associate vice president, utilities, energy and facilities management, University of Texas at Austin (UT Austin).

He added that for the last 10 years, the United States has produced more natural gas than any other country in the world. Greater supply means lower prices.

“Coal plants emit twice the amount of carbon dioxide as natural gas plants and are less efficient than CHP,” Ontiveros said. “As a result, the electrical grid economy is shifting toward more natural-gas-fed CHPs because the plants can be built faster and are more efficient.”

With new supplies of natural gas being

tapped, the country has shifted from importer to seller in the world market. This helps to keep prices low and further strengthens the U.S. economy.

“We are taking advantage of low prices to lock in natural gas needs for up to five years ahead, which will help to control our budget in the long term,” Ontiveros said.

The UT Austin Carl J. Eckhardt CHP plant provides all campus electricity, heating and cooling for more than 150 campus buildings serving 70,000 faculty, students and staff. This independent system ties into the City of Austin

grid as an emergency backup source of power. This enables the university to function at a higher rate of reliability and efficiency than what would be achievable through purchased energy.

The CHP plant can generate 134 megawatts of power and 1.2 million pounds per hour of steam. The single largest electrical load on campus is a cooling system that can provide 60,000 tons of chilled water to the campus, plus the equivalent of 20,000 tons of chilled water using thermal energy storage (TES) tanks. TES has helped the campus reduce its peak power demands.

“We are taking advantage of low prices to lock in natural gas needs for up to five years ahead, which will help to control our budget in the long term.”

— Juan Ontiveros, University of Texas at Austin

“Optimization of our TES system will enable us to store up to 10 MW of energy that can be used opportunistically to improve power generation efficiency, cooling efficiency and lead to more peak power reductions,” Ontiveros said. “This reduction allows the campus to grow without further monetary investment in energy production.”

Although the UT campus has more than doubled in size over the last 40



The University of Texas Austin (above) has a CHP plant that provides all campus electricity, heating and cooling for more than 150 campus buildings serving 70,000 faculty, students and staff.

University of Texas at Austin Carl J. Eckhardt CHP plant diagram

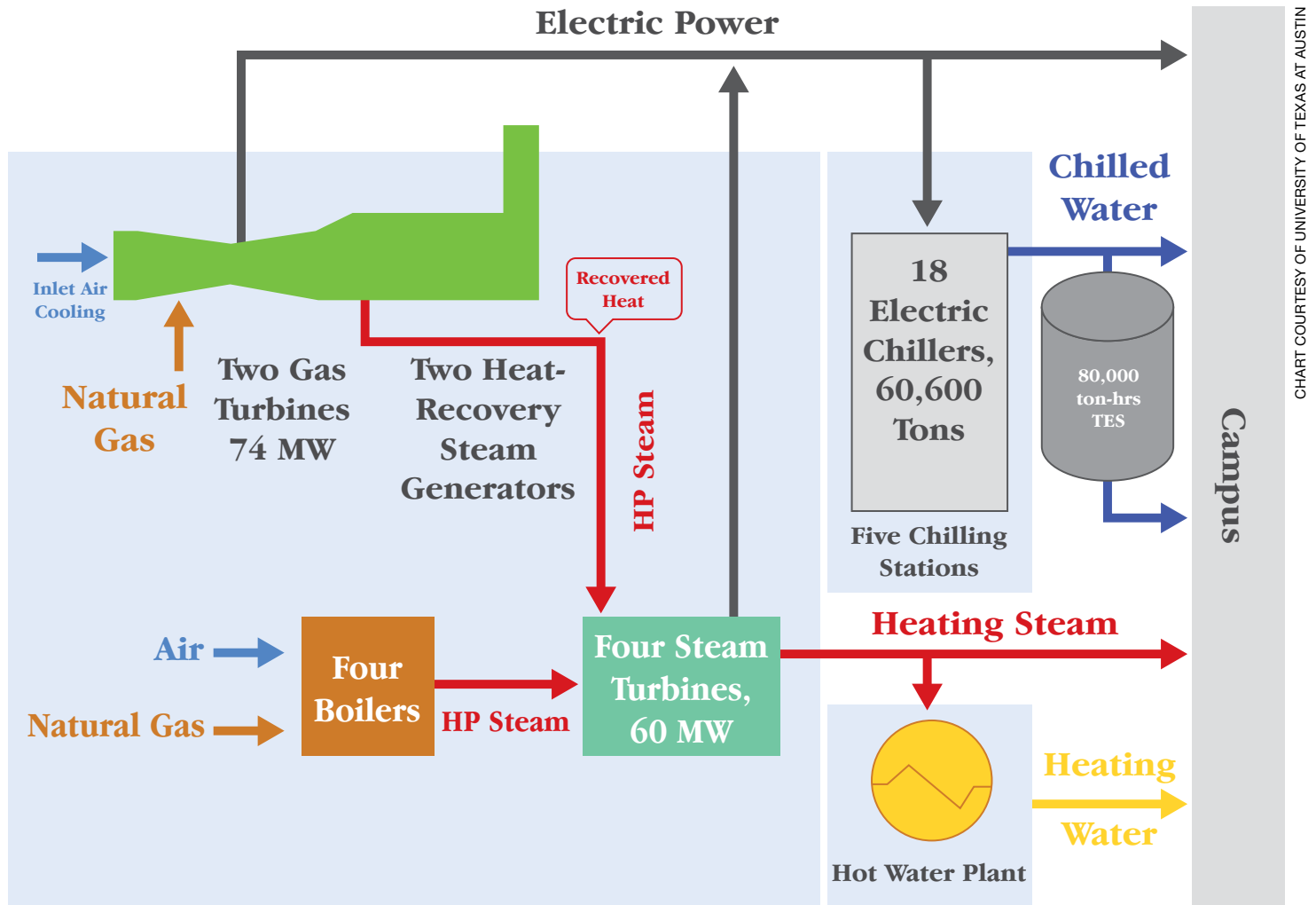


CHART COURTESY OF UNIVERSITY OF TEXAS AT AUSTIN

years, by leveraging the system and sustaining a culture of innovation, it uses the same amount of energy today as was used in 1976. Average annual efficiency jumped from 63% in 1996 to 85% today.

For example, one of the primary benefits that its CHP system provides is that most of the waste heat is used to generate steam which is used to produce electricity, heat the campus and make hot water for buildings. The system also includes 45,000 tons of chilled water capacity and a 4 million-gallon thermal energy storage tank, which is used to cool the inlet air of the combustion turbines to improve

efficiency and power production.

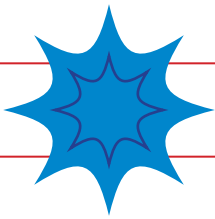
Resiliency is another benefit of the system, a result of UT Austin's approach to energy solutions and the multiple energy production and distribution options. The system also centrally produces 10 million gallons per year of demineralized water for campus labs and produces compressed air for facilities. Additionally, all building cooling coil condensate is captured for use in power and cooling system production. Since 2006, UT Austin has saved 1.4 billion gallons of water through increased efficiency and use of nonpotable water sources.

Ontiveros said the facility regularly

evaluates the potential for implementing renewable energy sources such as wind and solar. In terms of logistics and cost to the university compared to the 85% to 87% efficiency rate at which the CHP plant is already operating, switching to solar or wind power in the near future is not considered to be a viable option as it would significantly increase annual operating costs.

"Our electricity cost is about \$0.059 per kilowatt-hour, which is less than solar or wind in our area of the country," he said. "If we were to purchase 100% green power, our budget would increase by more than \$7.5 million per





COMBINED HEAT AND POWER

PHOTO COURTESY OF ARIZONA STATE UNIVERSITY



View from floor, showing Arizona State University's new turbine generator and associated industrial ductwork at the combined heat and power facility.

year because we would have to produce steam from boilers that are otherwise free via CHP, thereby increasing our natural gas buy."

CHP SUCCESS LEADS TO PLANT EXPANSION

Arizona State University (ASU) has been a user of CHP since 2006. The success of that initial project led to the recent expansion of its 8.8 MW CHP plant. The original facility consisted of a 6.8 MW Taurus 70 gas turbine supplied by Solar Turbines Inc., a 2 MW steam turbine generator and an 80,000 pounds per hour heat recovery steam generator (HRSG) from Rentech Boiler Systems Inc. An expansion project added another 8 MW via a gas turbine from Solar Turbines and a new 95,000 lb./hr. HRSG from Rentech.

Natural gas-based CHP is the primary source of power and is backed up by the utility. In addition to powering the research community, CHP provides district steam and power to the chilled water plant housed within the CHP plant to serve buildings throughout campus.

"Given ASU's rapid growth, especially in the research arena, the timing was

right for ASU to expand its source for reliable power with a second gas turbine in our CHP building," said Bruce Nevel, associate vice president, facilities development and management, ASU. "CHP provides reliable and redundant power for research-intensive buildings at the Tempe [Arizona] Campus."

ASU's plant additions are expected to save utility expenditures compared to purchasing the additional electricity from the grid. Also, Nevel said that the facility anticipates that its greenhouse gas emissions will decrease.

"The installation of the second unit was primarily driven by the need for an ultra-reliable power source for the university's expanded research capabilities," said Larry Holly, a supervisor at SW Gas Corp. "In addition, the second unit will allow the plant to produce up to 100% of the campus' steam needs throughout the year, leaving its existing boiler plant as a backup."

GAME-CHANGER

Other institutions are also finding CHP an excellent way to reduce costs and lower emissions.

"CHP is a huge step toward sustain-

ability and energy efficiency," said Christian Neve, chief sales officer, EC Power. "The concept has proven to be incredibly successful in the European market and it continues to grow in popularity."

This year, Mansfield Correctional Institution in Mansfield, Ohio, for example, is adding a 24kW, natural gas-based XRGI25 micro-cogeneration package from EC Power, with the waste heat used to provide hot water.

Tommy Olsen, market segment coordinator, Lochinvar LLC, the U.S partner for EC Power Systems, said the CHP plant includes Lochinvar FTXL 400,000 BTU boilers and the EC Power cogeneration system.

"By producing on-site power using clean natural gas, the facility met its environmental obligation required by the state," he said. "This is one segment of a long-term replacement project that will most likely see up to 21 additional boiler and CHP systems installed."

Olsen believes natural gas-based CHP is gaining in popularity due to the combination of low-cost, clean-burning natural gas with high-efficiency boilers, water heaters and micro-cogeneration. The ability to produce cheap electricity and hot water from a single fuel source simultaneously is seen by some as the future of energy independence and helps to build grid resilience and lower emissions.

"CHP is a game-changer for the North American market as commercial facilities such as inpatient care, universities, hotels and multifamily complexes have an increasing desire for products that provide reliable hot water and reduced energy costs," Olsen said. **CHP**



For more information about combined heat and power (CHP), visit:

Understanding CHP:
www.understandingchp.com

Solar Turbines Inc.: www.solarturbines.com

Rentech Boiler Systems Inc.:
www.rentechboilers.com

EC Power Systems: www.ecpower.eu

Keeping the lights on

Microgrid CHP offers savings, as well as resilience during power outages.

BY DREW ROBB

The occasional power outage used to be acceptable. However, that is changing as new technologies open the door to higher levels of resiliency. University campuses, for example, are showing great

interest in establishing microgrids using combined heat and power (CHP) to ensure critical systems stay online regardless of the state of the local power grid.

“Campus settings are excellent candidates for microgrids as most have existing hot water, steam or chilled water distribution systems that can be addressed with CHP as well as existing electrical and gas distribution systems,” said Jake Friedman, manager, project development and engineering, Microgrid Competency Center of Schneider Electric USA.

CHP typically serves as the anchor resource which delivers most of the power to the campus, in conjunction with distributed resources such as rooftop solar or battery storage. For both financial and technical reasons, natural gas-fueled CHP is often the best fit for delivering a high level of resiliency and reliability to a campus during more extensive grid outages, Friedman said. He suggested that campus energy managers team with developers or engineers experienced in CHP technologies.

“Natural gas fuel is usually one of the largest drivers of campus microgrid

economics,” Friedman said. “Historically low gas prices and high-efficiency, clean-burning, gas-powered generation equipment enables project owners to generate power cheaper than the grid while enhancing resiliency against electric grid outage and drastically reducing their carbon footprint.”

“Campus settings are excellent candidates for microgrids as most have existing hot water, steam or chilled water distribution systems that can be addressed with CHP as well as existing electrical and gas distribution systems.”

— Jake Friedman,
Microgrid Competency
Center of Schneider
Electric USA

WHAT OUTAGE?

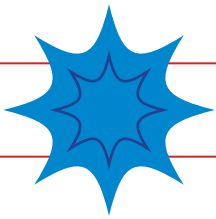
Take the case of Mississippi State University (MSU). It is in the final stages of building a trigeneration microgrid for cooling, heating and power at its College View student residential-retail complex. Partners include Blue Sky Power, Mississippi State, Atmos Energy and Greystar Real Estate Partners. The *(continued on page 11)*

PHOTO COURTESY OF ATMOS ENERGY CORP.



Mississippi State University is in the final stages of building a trigeneration microgrid for cooling, heating and power at its College View student residential-retail complex.





A supreme solution

Athletic club turns to CHP to meet energy conservation goals.

BY TONYA MCMURRAY

Columbia Association's strategic plan calls for the use of innovative technology and conservation practices to create strong environmental stewardship.

So, when the nonprofit service corporation was looking for ways to reduce costs and improve efficiency for its largest full-service fitness facility, it turned to combined heat and power (CHP).

Supreme Sports Club is a 24-hour, 100,000-square-foot health and fitness club with three pools, a basketball arena, racquetball courts, a free weight area and a cycle studio serving the

broader Columbia, Maryland, community and Howard County. As the most energy-intensive facility operated by Columbia Association, the sports club was an ideal candidate for CHP.

Recreational facilities are among the best applications for CHP, also called cogeneration, because they have a consistent need for hot water for showers, pool heating and space heating while

also needing significant electricity for equipment, said Jeffrey Glick, vice president, sales, Tecogen Inc.

"With cogeneration, we look for sites with a lot of hot water usage because the unit can only be economical if we're producing hot water and electricity simultaneously," Glick said.

CHP offered a unique technological solution to meet both electrical and heating needs, said Jeremy Scharfenberg, energy manager, construction and facilities management, Columbia Association.

PHOTO COURTESY OF COLUMBIA ASSOCIATION



A 60-kilowatt Tecogen combined heat and power unit provides the Supreme Sports Club with round-the-clock electricity generation and heating for pools, hot water for laundry and showers, and space heating for the natatorium while helping the facility reduce utility costs and meet the goals of an aggressive energy management program.

COST AND ENERGY SAVINGS

Supreme Sports Club installed a 60-kilowatt Tecogen CHP unit with a natural gas engine in the spring of 2016. The system delivers energy efficiency and cost savings while providing heat for the pools, hot water for laundry and showers, and space heating for the natatorium.

“Columbia Association has a progressive energy management program aimed at reducing energy consumption, lowering utility costs and protecting the climate,” Scharfenberg said. “Our CHP system has been a key feature of the Columbia Association’s sustainability program and is our most impactful energy conservation measure.”

Glick estimates the CHP outputs of electricity and hot water are produced at an efficiency between 80% to 90% compared to the 30% efficiency of the power supplied by the grid. In addition, he said, CHP can cut gas consumption

“With cogeneration, we look for sites with a lot of hot water usage because the unit can only be economical if we’re producing hot water and electricity simultaneously.”

— Jeffrey Glick, Tecogen Inc.

by up to half and carbon emissions by about 50%.

Scharfenberg said the CHP system has saved Columbia Association \$25,000 a year in energy costs since its implementation while providing a reliable heat and electricity supply.

WAIT . . . THERE’S MORE

To offset the installation cost of the CHP system, Columbia Association turned to the Baltimore Gas and Electric Co.’s Smart Energy Savers Program, which provided incentives for the design, implementation

and production of the technology.

“The economics made good sense and allowed Columbia Association to take a bold step to improve the sustainability of our operations,” Scharfenberg said. **CHP**



For more information about combined heat and power (CHP), visit:

Understanding CHP:
www.understandingchp.com

Tecogen Inc.:
www.tecogen.com/chp-cogeneration

Keeping the lights on

(continued from page 9)
microgrid combines natural gas-fired CHP and a centralized chilling and heating system.

“The MSU Clean Energy Microgrid will operate in parallel with the grid, as well as an island from the grid during power outages to provide safe, clean and resilient energy,” said James Carskadon with

Mississippi State’s office of public affairs. “The system covers baseload power needs, as well as 100% of emergency power demand, to keep critical loads operating in an outage.”

The project will have an electrical capacity of 285 kilowatts and will eliminate 750 metric tons of carbon dioxide annually.

“This CHP project is the first-ever in Mississippi for use in apartments, and MSU is already planning phase 2 for this location,” said Lance Coe, industrial sales representative, Atmos Energy. “By supplying natural gas to this campus microgrid, MSU will save approximately \$116,000 in electric utility costs every year.” **CHP**

PHOTO COURTESY OF ATMOS ENERGY CORP.



MSU’s microgrid CHP project is the first-ever in Mississippi for use in apartments, and MSU is already planning phase 2 for this location.

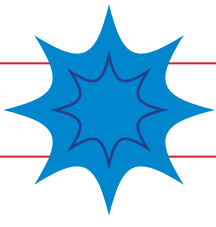


For more information about combined heat and power (CHP), visit:

Understanding CHP:
www.understandingchp.com

Microgrid Competency Center of Schneider Electric USA: www.schneider-electric.us/en/work/solutions/microgrids





Valuing rapid returns

Health and elder care entities gravitate to CHP.

BY DREW ROBB

Health care and elder care facilities throughout North America are realizing that natural gas-fueled combined heat and power (CHP) makes sound economic and environmental sense.

When facilities are switched from grid power and the generation of steam or hot water from traditional boilers, they often realize a rapid return on investment due to significantly lowered utility bills. Further, the boost in efficiency by changing to CHP can be so dramatic that overall emissions levels also decline substantially. That's why many hospitals, retirement communities and medical centers are turning to CHP in increasing numbers.

"Natural gas-based CHP is growing in popularity as the savings and payback are real with a lot of happy customers,"

said Aaron Tasin, vice president, sales, 2G Energy Inc. "Emissions are much lower with natural gas CHP compared to a facility using electricity from a central power plant and on-site boilers."

The City of Windsor in Ontario, Canada, for example, recently installed a CHP system at its Huron Lodge facility. This 177,000-square-foot, long-term care home for all ages is one of the largest consumers of gas and electricity in the municipality.

Natural gas at Huron Lodge is used for heating, kitchen and laundry equip-

ment, as well as for providing hot water through six main hot water boilers. These boilers provide water at temperatures ranging from 120 degrees Fahrenheit to 160°F. The CHP system maximizes efficiency via waste heat recovery from the exhaust of a 400-kilowatt internal combustion engine.

2G Energy's engine and generator set includes selective catalytic reduction (SCR) technology to minimize emissions. If needed, the facility can switch immediately from CHP generation to the grid. This gives maintenance personnel the ability to perform maintenance actions on the system when required. A heat recovery unit on the exhaust stack boosts the amount of thermal energy in the jacket water system when needed by the facility. This helps to reduce the amount of natural gas consumption by hot water boilers.

The natural gas CHP system has been running successfully at Huron Lodge for two years. It was recently subjected to a detailed engineering study to determine the economic benefits. With system efficiency being measured at about 73%, the study estimated that electricity savings amounted to \$343,000 per year. In addition, natural gas savings were estimated at \$78,000 per year.

"Enbridge Gas [Inc.] assisted the city to implement this highly efficient combined heat and power technology," said Sokol Aliko, supervisor, energy contracts, City of Windsor.

He noted that the availability of incentives partly influenced the City of Windsor's decision to pursue the development of CHP systems. Utilities around the country offer a variety of incentives to encourage municipalities



PHOTO COURTESY OF HURON LODGE

The City of Windsor in Ontario, Canada, recently installed a combined heating and power system at its Huron Lodge care facility, a 177,000-square-foot, long-term care home for all ages that is one of the largest consumers of gas and electricity in the municipality.

“Energy reduction measures like the CHP plant not only reduce the carbon footprint of the Milton S. Hershey Medical Center, they [also] save millions of dollars in utility costs each year.”

**— Kevin Kanoff,
Milton S. Hershey
Medical Center**

and facilities to consider CHP. Some offer a way to reduce initial costs for equipment while others provide ways to cut down on system running expenses. Such programs are particularly successful in getting organizations to consider CHP for the first time. However, once they gain experience with natural gas systems, they often decide to implement additional CHP projects.

As a result of the success of Huron Lodge, the City of Windsor has installed CHP at a sports complex, and it is in the latter stages of installing CHP at a water park and pool facility.

“Natural-gas based CHP is being deployed more and more due to its system efficiency gain over traditional heating systems as well as its ability to provide both heating and power,” said Abdalla Darwech, senior analyst, Enbridge Gas.

SAVINGS FOR RETIREMENT HOME EXPANSION

Simpson House in Philadelphia, Pennsylvania, is another facility that recently installed CHP. This retirement community — offering independent living, personal care, inpatient and outpatient rehabilitation, and skilled nursing services — saw a strong need to improve energy-cost stability and control by replacing its old, failing infrastructure.

This presented the perfect opportunity to embrace a modern, highly efficient, natural gas-fired CHP plant to bolster resiliency and offset carbon emissions. The team installed a 265-kW natural gas CHP unit from Centrica PLC that fulfills about 70% of electrical power needs.

Hot water from the CHP unit displaces load from the lead boiler and is distributed throughout the facility for heating and domestic hot water. Additionally, an absorption chiller provides cooling during the warm summer months. As part of this extensive infrastructure upgrade, Simpson House received a new boiler, a cogeneration unit, an absorption chiller, energy-efficient lighting and a building automation system to control about 50 valves that previously had been manually operated at the change of seasons.

“Almost all of these systems were failing and needed to be replaced,” said Sherif Youssef, director, major accounts and marketing, Philadelphia Gas Works.

Ben Parvey, CEO, Blue Sky Power, a clean energy infrastructure developer, said Simpson House avoided having to spend an additional \$3 million for mechanical and electrical upgrades by implementing CHP. These savings freed up enough capital for the construction of a new building at Simpson House to provide more skilled nursing and assisted care for seniors.

Facilities with substantial heating and cooling loads — such as in senior living, collegiate housing, health care and manufacturing — are prime candidates for CHP. This efficient technology engenders lower and more stable energy costs by decreasing energy usage, which also eliminates significant carbon emissions.

“The combination of efficiency, sustainability and resiliency makes CHP a smart choice for most facilities,” Youssef said.

HEALTH CARE FACILITIES EMBRACING CHP

Like many in the health care industry,

the Penn State Health Milton S. Hershey Medical Center has experienced the value of CHP. It previously bought electricity from the grid and used a separate large boiler plant to produce steam and chilled water. It installed an 8-megawatt Solar Taurus 70 gas turbine by Solar Turbines Inc. along with a heat recovery boiler.

The natural gas-fired CHP plant generates 60% of the campus’ electricity as well as the majority of the steam required for climate control (heating and cooling), cooking, domestic hot water and sterilization of medical equipment. System efficiency soared from 45% to 80%. Also, campus carbon emissions were slashed by 46,000 tons per year, the equivalent of taking 7,551 cars off the road.

“The drivers for this project were reliability, dependability, cost and overall efficiency,” said Steve Bareuther, relationship manager for major accounts, UGI Utilities Inc. “Natural gas-based CHP is much cleaner burning than grid power. As it is cheaper, it has a more rapid pay-back period.”

Environmental and sustainability were among other benefits noted. As a result, the U.S. Green Building Council of Central Pennsylvania presented a special, 2018 Climate Champion award to the Milton S. Hershey Medical Center.

“Energy reduction measures like the CHP plant not only reduce the carbon footprint of the Milton S. Hershey Medical Center, they [also] save millions of dollars in utility costs each year,” said Kevin Kanoff, campus energy engineer.

He estimates that natural gas-based CHP will lower utility costs at the medical center by \$2.5 million annually. **CHP**



For more information about combined heat and power (CHP), visit:

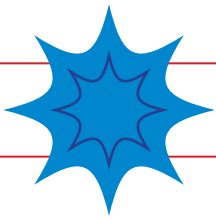
Understanding CHP:
www.understandingchp.com

2G Energy Inc.: www.2g-energy.com

Centra PLC: www.centrica.com

Solar Turbines Inc.: www.solarturbines.com





Bringing big benefits

Micro CHP offers clean, reliable and cost-effective energy for apartments and farms.

BY TONYA MCMURRAY

Apartment buildings and dairy farms have one thing in common — the need for abundant and dependable hot water. Innovative pilot programs throughout the United States and Canada are proving

that micro combined heat and power (mCHP) can provide a robust hot-water solution while also generating energy savings.

Micro CHP (mCHP) is a proven tech-

nology popular in Europe and Asia for its reliability, cost-effectiveness and clean-energy generation. Like larger CHP systems, mCHP captures excess heat from the production of electricity and provides on-site generation of electricity, heat and hot water. While larger CHP systems typically operate in large buildings or campus-type environments, mCHPs are designed for smaller buildings and homes.

stalled in Japan, the technology is well validated, he said. The first U.S. pilot of the COREMO was sold in 2014 with in-house evaluations followed by field tests in 2015 and 2016 and utility demonstrations starting in 2017. There are now about 60 units installed throughout North America.

‘CENTSIBLE’ SAVINGS

In early 2019, RISEBORO, a housing developer and manager for low- to moderate-income residents, installed four COREMO units in small buildings in Brooklyn, New York, as part of a National Grid USA Service Co. demonstration project under New York state’s Reforming the Energy Vision initiative.

National Grid partnered with Centsible House Inc., which develops and manages

PHOTO COURTESY OF NATIONAL GRID USA SERVICE CO.



Aisin World Corp. of America’s COREMO micro combined heat and power system provides housing developer RiseBoro Community Partnership Inc. with reliable hot water and electricity generation as part of New York state’s Reforming the Energy Vision initiative. Aisin is planning full North American commercialization of COREMO in September 2020.

“Micro CHP provides good economic savings because you’re using inexpensive gas to replace the high price of electricity.”

— Yoshi Sekihisa, Aisin World Corp. of America

“Micro CHP provides good economic savings because you’re using inexpensive gas to replace the high price of electricity,” said Yoshi Sekihisa, manager, life and energy department, Aisin World Corp. of America.

Sekihisa is leading Aisin’s pre-commercialization activities for the COREMO, an mCHP system that has been in operation since 2009. With more than 5,000 units in-

advanced energy programs, to recruit customers and install the mCHP system.

“Since 2016, we have worked with small, mixed-use and residential buildings to convert conventional heating systems to a hybrid solution that includes gas and electric heating and cooling systems,” said Julie Liu, founder, Centsible House and the Aisin COREMO regional representative.

Because mCHP systems generate both electricity and hot water, they provide significant benefits to customers, said Christopher Cavanagh, principal



PHOTO COURTESY OF ATCO LTD.

The Alberta government partnered with Alberta Milk and provided a one-time grant for ATCO Ltd. to install 24 Aisin 1.5 kW mCHP units in dairy farms across the province that began in fall 2019. Alberta Milk is a nonprofit organization that represents Alberta’s dairy producers.

program manager, future of heat, National Grid.

“For customers, efficient and reliable mCHP products like Aisin’s save substantial energy costs in hot water and in electricity because it can be net-metered like a solar panel, and mCHP can also provide backup power,” he said. “The bigger the need, the bigger the savings. For electric utilities, it’s a technique to lower peak demand, and for gas utilities, it improves load factor all while dropping greenhouse gas emissions.”

The four installations in RISEBORO properties are generating annual energy savings of between \$2,000 and \$2,500, Sekihisa said. Those type of savings could translate into a payback of about seven years on the investment of mCHP equipment purchased without incentives or rebates. With incentives such as those offered by New York and other states, the

“This will result in both utility cost savings as well as a lower environmental impact compared to the electric grid.”

— Abbas Ali Beg, ATCO Ltd.

payback period could drop to about three years.

The mCHP system also significantly reduces greenhouse gas emissions. For every kilowatt of electricity generated onsite with the additional use of the waste heat, carbon emissions are reduced between 40% and 60%, Sekihisa said. The Centsible House installations have seen a 55% reduction in carbon emissions.

ON THE FARM

Like apartment buildings, dairy farms can see significant cost and energy savings with mCHP systems that also meet their high demand for hot water.

On some dairy farms, milking equipment and facilities have to be washed throughout the day, creating a continuous demand for hot water, said Abbas Ali Beg, senior engineer, research and development, ATCO Pipelines and Liquids Global Business Unit, ATCO Ltd.

Farmers use excess heat from the mCHP system to heat water needed to clean equipment. The electricity generated offsets what the dairy would typically purchase from the grid.

ATCO has two units in service in Taber, Alberta, which have produced close to a 90% utilization of the mCHP, Ali Beg said.

“This will result in both utility cost savings as well as a lower environmental impact compared to the existing electric grid,” he said.

The Alberta government has been supporting energy efficiency initiatives in agriculture for many years. As a result, it partnered with Alberta Milk and pro-

vided a one-time grant for ATCO Ltd. to install 24 Aisin 1.5 kW mCHP units in dairy farms across the province that began in fall 2019. Alberta Milk is a nonprofit organization that represents Alberta’s dairy producers.

EXPANDING mCHP IN NORTH AMERICA

Sekihisa expects continued interest in mCHP throughout the U.S. and Canada, especially as pilots prove the value of the mCHP technology to the North American market.

The COREMO unit is the first mCHP unit under 35kW to be included in the NY State (NYSERDA) CHP catalog, the first step in being eligible for a variety of utility and governmental incentives. It is also the first CHP product of any size to receive New York City building permits in the same manner as an ordinary heating appliance.

Aisin plans to deploy an additional 60 to 80 units in New York and another 60 to 100 units in Canada. And, the company is still looking for utility partners to conduct additional pilots before the planned full commercialization of the product in September 2020, Sekihisa said.

“People are most interested in the economic savings,” he said. “The savings is a huge benefit for both hot water and electricity.” **CHP**



For more information about combined heat and power (CHP), visit:

Understanding CHP:
www.understandingchp.com

Aisin World Corp. of America:
www.aisinworld.com





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