BARRY J. SANDERS

Single Fuel Source Offers Savings

The use of combined heat and power systems has yielded significant cost and energy efficiencies for some long term care providers.

UTILIZING COMBINED HEAT AND power (CHP) systems is an opportunity for long term care providers who want to become more energy efficient, reduce operating costs, and diminish their carbon footprint. Also known as cogeneration, CHP is the simultaneous production of two types of energy—heat and electricity—from one fuel source.

The key components of a CHP system are an engine and an electric generator. As the natural gas-fueled engine spins the generator to produce electricity, the natural byproduct of the working engine is heat. That heat is captured and used for space heating, domestic hot water, laundry hot water, or heat for swimming pools and spas.

The CHP process is very similar to an automobile, where the engine provides the power to rotate the wheels and the byproduct heat is used to keep the passengers warm during the winter months. In one form or another, CHP systems have been around since the late 19th century when Thomas Edison created the first power plant, producing electricity and usable heat simultaneously.

The U.S. Department of Energy (DOE) describes CHP as "a proven and effective energy resource, deployable in the near term, that can help address current and future U.S. energy needs." Already used by many large industrial, commercial, and institutional facilities, CHP use today reduces fuel consumption by 248 million metric tons of carbon dioxide (CO_2) emissions annually—equivalent to removing more than 45 million cars from the road, a recent DOE study found.

A CHP system consists of an engine and a generator.

CHP In Long Term Care

Nursing facilities and assisted living communities are excellent candidates for CHP systems because they have high electrical and thermal energy needs that generally follow each other and have significant round-the-clock energy demands.

CHP systems have traditionally been acquired through a cash purchase, but there are more options for utilizing CHP today, some of which allow properties to maximize savings and better match their own financial and cash flow requirements and in some cases avoid any investment.

As long as it is sized according to the heat and hot water energy needs of the property, a CHP system uses fuel very efficiently because it can provide electricity and heat at a combined efficiency of almost 90 percent.

In contrast, the heat produced at an electric utility power plant goes into the cooling water or up the smokestack, along with greenhouse gases and other pollutants. As a result, two-thirds of the fuel's energy is wasted at the electric utility.

A properly sized CHP system, on the other hand, recovers—and deploys—nearly all of the heat produced while generating electricity. This is possible because the system can be located on-site, not 300 miles away like many power plants.

Federal Support

Due to the significant cost-effective emissions reductions of CHP, the Environmental Protection Agency encourages greater use of the technology through an initiative known as the CHP Partnership in an effort to foster cooperation between stakeholders relevant to the CHP industry, including manufacturers, project developers, utilities, state and local governments, and end users.

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"Despite [its] proven track record, CHP remains underutilized and is one of the most compelling sources of energy efficiency that could, with even modest investments, move the nation strongly toward greater energy security and a cleaner environment," the DOE study says. "Indeed, ramping up CHP to account for 20 percent of U.S. electricity capacity—several European countries have already exceeded this level—would be equivalent to the CO_2 savings of taking 154 million cars off the road."

According to DOE, industrial applications, providing power and steam to large industries such as chemicals, paper, refining, food processing, and metals manufacturing make up 88 percent of U.S. CHP capacity, while hospitals, schools, campuses, nursing facilities, hotels, and office and apartment complexes utilize 12 percent of existing capacity.

DOE has established eight regional CHP application centers across the United States to provide local technical assistance and educational support for CHP development.

The cost of installing a CHP system ranges from $3,000 to $4,000 per kilowatt (kw) installed. For some long term care facilities with a stretched budget, finding the cash to fund a CHP project presents a challenge. Payback on the project can range from four to six years, after which time the system may provide up to 30 percent energy cost savings.

In some cases, once the equipment is in place, the property owner is responsible for operating and maintaining the system.

Providers Realize Savings

The amount of annual energy savings a facility can expect from a CHP system will vary, based on a number of key factors, including the size and location of the property; the amount of hot water required; local energy rates; the difficulty of the installation; the cost of capital, maintenance, and operation costs; the initial investment; and how the project is managed.

Although these variables create a wide range for savings and costs, most successful projects save the property between $10,000 and $200,000 per year.

A 300-bed long term care facility utilizing a 300 kw CHP system can offset approximately 1,200 tons of carbon dioxide each year. This is equivalent to the amount of carbon absorbed by 400 acres of forest or saved by removing 250 cars from the road.

Atlantis Rehabilitation & Residential Healthcare Facility, a 400-bed long term care facility in Brooklyn, N.Y., was considered an ideal candidate for the installation of a CHP system, but Brian Glattstein, the administrator, considered it cost-prohibitive—until he learned about a CHP service provider willing to share the up-front costs and subsequent savings. Atlantis contributed $75,000 in up-front capital plus a $150,000 grant from the state toward the purchase and installation costs. "The first 18 months of savings offset our initial investment," says Glattstein. "Thereafter, it just became savings for the facility off the bottom line."

In 2006, Trent Center East, a 229-

CHP Offers Financing Options

A property's financial position, technical competence, and energy objectives will dictate which financing option is best for installing a CHP system. Following are three options currently available to long term care facilities.

■ *Leasing.* In addition to all equipment maintenance and fuel costs, the property owner directly pays for the initial engineering, equipment, and installation costs through a monthly finance fee. The capital expenses are financed through a leasing group that retains ownership until the lease is paid off. If leasing a CHP, facilities do not need any up-front capital. The goal is for the monthly energy savings to exceed the monthly lease payment and operating expenses to create a net positive cash flow. However, the facility's credit-worthiness influences acceptance and the interest rate.

■ *Shared Savings/Performance Contract.* In this model, the facility pays for equipment maintenance, fuel, and operating fees, while a third-party supplier provides the engineering, equipment, and installation for the CHP system. The facility keeps a percentage of the actual energy savings, typically 10 to 25 percent, and the supplier keeps the remainder as one of its fees. With this option, facilities do not need any up-front capital, but the savings may not be as high as other options. In addition, the facility retains all equipment operating responsibility and is required to sign a long-term agreement.

■ *Outsourced CHP.* Outsourcing a CHP enables facilities to choose an on-site utility or outsource model in which experts manage the financing, installation, and operation of the CHP system installed at the property. With an on-site utility model, a service company self-finances, owns, installs, operates, and maintains a CHP system at no cost to the customer. The customer only pays for the energy it uses from the CHP system.

Because CHP is so efficient, the cost of the energy it produces is priced lower than the property's costs from the local utility rates. All engineering, equipment, installation, and operating costs are the sole responsibility of the service company. The energy purchased by the customer is typically priced at 10 to 15 percent below the local utility current energy price.

unit seniors housing high-rise in Trenton, N.J., upgraded its air conditioning system and avoided a major capital expenditure by replacing an aging absorption chiller with a chiller CHP system. In addition to realizing an annual energy savings of $30,000, Trent Center avoided a capital expense of $450,000. What's more, the old chiller's annual maintenance expense of $20,000 was eliminated.

Utility costs had been increasing for years at Penacook Place, a 160-bed, not-for-profit nursing and rehabilitation facility in Haverhill, Mass. While Julian Rich, president and chief executive officer of Penacook, had continuously looked for innovative ways to lower those costs in order to avoid cutting services, he was not in a position to spend capital.

Already familiar with CHP, Rich assumed the purchase and installation of such a system would be too costly, until he learned about an option that would allow him to install an on-site CHP system at no cost and without financing. According Rich, it was "one of the easiest executive decisions I've ever made. It was a no-brainer."

With the on-site utility model, the service provider sells the energy produced by the CHP system to Penacook at a price guaranteed to be lower than the local utility. Penacook pays only for the energy used.

The service provider is responsible for operating costs and equipment maintenance. "We could not have afforded this highly efficient energy system without the on-site energy service provider," says Rich.

CHP Candidates

The following qualifying criteria determine whether or not a property is a good candidate for a CHP system:

- Natural gas is available on site;
- Domestic hot water is supplied from a central boiler plant;
- Space heating is supplied from a central plant that has hydronic distribution;
- The average electric rate from all suppliers is greater than $0.10 per kwh, found in a monthly electric bill; and
- The facility has more than 120 beds.

A property that qualifies for CHP should be evaluated before installation takes place. Most credible suppliers offer free evaluations. ■

For More Information

■ To find a DOE Regional Application Center, go to: www1.eere.energy.gov/industry/distributedenergy/racs.html.