HOSPITALITY CONSTRUCTION

Special Section

Green Building

The value of combined heat/ power systems: Green energy

By Barry J. Sanders

With the price of oil hovering around $100 per barrel (and some analysts suggesting that we are only a few months away from $200 per barrel), most hotel properties are seeking strategies to lower energy costs. Now is an excellent time to review the background, benefits and options with combined heat and power systems.

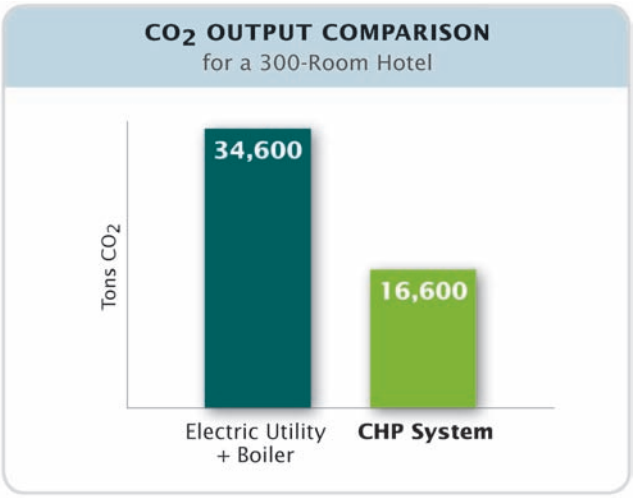
Available since the time of Thomas Edison, CHP systems become popular when the United States faces an energy crisis. With energy prices now setting new records, CHP systems are an effective tool for hospitality venues to lower energy costs. CHP systems are more efficient and more environmentally friendly than the electric utility plus an on-site boiler. While reducing operating costs, CHP systems also demonstrate the hotel ownership's commitment to the environment since CHP reduces greenhouse gases and can provide LEED points.

What is CHP?

Combined heat and power or CHP, also called cogeneration or distributed generation, is the simultaneous production of two types of energy — heat and electricity — from one fuel source, often natural gas. The ability to create two forms of energy from a single source offers tremendous efficiency and thus both cost savings and environmental benefits.

The key components of a CHP system are an internal combustion, reciprocating engine driving an electric generator. The clean, natural gas-fired engine spins a generator to produce electricity. The natural byproduct of the working engine is heat. The heat is captured and applied in hotel property applications to supply space heating, heating domestic hot water, laundry hot water or to provide 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 in the cabin during the winter months.

A CHP system supplies electricity, heat and hot water.



The energy from a combined heat and power system has half the carbon footprint than the energy produced by conventional means (electric utility plus boiler).

CHP systems use fuel very efficiently. A CHP system provides electricity and heat at a combined efficiency of more than 80 percent. This is a significant improvement over the combination of the 33 percent efficient electric utility and a conventional heating boiler with a 70 percent seasonal efficiency.

Why is there such a big difference in fuel efficiency between the electric utility and a CHP system? The electric utility and CHP each produce electricity and heat from one source of fuel. However, the heat produced at the electric utility is not used; it goes into the cooling water or up the smokestack along with greenhouse gases and other pollutants. Most (two-thirds) of the fuel's energy is wasted. On the other hand, while generating electricity, a properly sized CHP system recovers all of the heat it produces and deploys it on site.

In addition, when purchasing power from the electric utility, a separate source of heat (usually a boiler) is required. Despite using an efficient boiler, the total fuel required to produce conventional electricity and boiler heat is greater than the amount of fuel required to produce simultaneous energy with a CHP system. This demonstrates why CHP-produced energy is more cost effective than the combined energies from the electric utility and local boilers.

CHP systems also provide significant global benefits. CHP systems reduce the demand on the nation's utility grid, increase energy efficiency, reduce air pollution and greenhouse gas emissions and protect the property against power outages, while significantly lowering utility costs of building operation.

Own vs. outsource

Installing a combined heat and power system requires capital and experience. Most installation costs range from $3,000 to $3,500 per kW installed. Depending upon location, property type and local energy rates, simple payback can range from four to six years. Once the equipment is in place, the property owner is responsible for operating the system. The owner also must maintain the systems, requiring either internal man-hours or a third-party service contract. For hotels with a stretched budget competing for capital improvements, finding the cash for a turnkey cogeneration project presents a challenge.

The latest trend is for hotels to elect an on-site utility or outsource model and to allow experts to manage the installation and operation of the CHP system installed at their property site. With an on-site utility model for CHP, a service company owns, installs, operates and maintains a CHP system at no cost to the hotel. The hotel 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 local utility rates. All installation and operating costs are the responsibility of the service company. Again, the hotel only pays for the energy, which is typically priced at 10 percent below the current energy price. A 300-room hotel may be able to save as much as $2 million over the term of an agreement.

For a hotel, this is a great opportunity to save a significant amount of money at no cost and no risk. The hotel has no capital expenditure, no maintenance costs and no fuel costs. The hotel's responsibility is limited to paying only for the discounted energy it actually uses from the CHP system.

The on-site utility model for CHP allows hotels to enjoy the fiscal and global benefits of CHP — efficiency, lower operating costs, significantly reduced energy costs and decreased carbon footprint — while avoiding the drawbacks of ownership — initial capital expenditure, operating and maintenance costs and manpower requirements.

Environmental benefits

Combined heat and power systems offer considerable environmental benefits because less fuel is combusted when compared with purchased electricity from the utility and on-site-generated heat from a boiler. Because CHP systems require less fuel and burn more efficiently, they reduce greenhouse gas emissions, such as carbon dioxide, as well as criteria air pollutants like nitrogen oxides and sulfur dioxide.

A 300-room hotel utilizing a 300 kW CHP system can offset approximately 18,000 tons of CO_2 over the term of an agreement. This is equivalent to the amount of carbon absorbed by 400 acres of forest or saved by removing 250 cars from the road each year for 15 years. The CHP Green Benefit also gives hotels a more competitive edge as greater numbers of consumers actively seek to do business with green organizations.

When considering other clean energy options, such as solar, keep in mind that solar power systems require the electric utility to supply back-up power

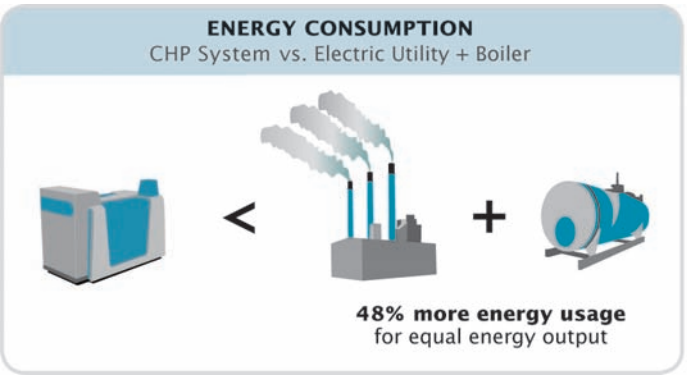
on cloudy days and at night, plus they need a boiler to produce heat and hot water. As a result, a CHP system is actually better for the environment (lower greenhouse gas emission) than a solar power system, and CHP provides a significantly better ROI.

The annual CO_2 emissions reduction of a CHP system for a 300-room hotel is 1,466 tons versus 440 tons for a solar power system with the electric utility and a boiler. That's 250 percent greater CO_2 emissions reduction for a CHP system. Additionally, a 300-room hotel can expect around $2 million in total cost savings over a 15-year period with a CHP system; whereas with a solar power system, the same hotel will still not see a return on its investment after 15 years of operation. Finally, under the LEED accreditation point system under the category Energy and Atmosphere, CHP systems can receive up to 10 LEED points.

Is my hotel a good candidate?

Now that you know what CHP is and what its benefits are, the following qualifying criteria can help you easily determine whether or not your hotel is a good candidate for a CHP system.

- Your hotel has more than 100 rooms.
- Natural gas is available on site.
- There is a central boiler plant supplying domestic hot water for the property.
- Space heating is supplied from a central boiler plant with hydronic distribution.



A CHP system requires less fuel than the electric utility plus boiler to produce the same amount of energy.

- There is an on-site laundry, banquet facility or heated swimming pools or spas.
- The average electric rate from all suppliers is greater than $0.09 per kWh.

A combined heat and power system has significant value — both economic and environmental — for hotels. If your hotel is a good candidate, you should consider retrofitting a CHP system into an existing hotel or including it in the design of a new hotel. ■

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