



Combined Heat and Power

An Energy Efficient Choice for Mid-size to Large Hotels

Combined heat and power (CHP), also known as cogeneration, can be an excellent solution for controlling energy costs while improving the reliability of power supply for your hotel. With CHP, your hotel can:

- Reduce operating costs and control rising energy costs
- Ensure the availability of reliable hot water and electricity supply
- Increase energy efficiency and improve environmental performance

What Is CHP?

CHP is the production of both power and heat from a single fuel source. By making use of the waste heat from on-site electricity production for heating or cooling, CHP increases fuel efficiency and decreases energy costs.

For hotels with 100 to 500 rooms, CHP system sizes typically range from 60 kilowatts (kW) to 350 kW, depending on the size and energy requirements of the hotel.

For information on CHP systems for hotels and casinos with more than 500 rooms, see the CHP Partnership's companion factsheet, *CHP for Large Hotels and Casinos*.

What Can CHP Do for You?

Reduce Energy Costs

With fuel prices at a record high, energy costs have been rising for hotels. CHP offers a solution to control spiraling energy costs. The hospitality industry spends nearly \$4 billion per year on energy. Increasing energy costs are a major concern for hotels, particularly as demand for more hotel amenities, such as restaurants, lounges, retail shops, and recreational facilities, has increased

electricity and natural gas consumption industry-wide.

The market analysis for hotels and casinos developed by the U.S. EPA's Combined Heat and Power Partnership¹ shows that more than 9,000 of the nearly 48,000 hotels in the United States have energy characteristics suitable for current CHP technology. More than 1,000 of these sites are likely to meet a simple payback on their investment within five years or less.

¹ Available at www.epa.gov/chp/project_resources/hotels.htm

Increase Energy Efficiency and Improve Environmental Performance

With the improved efficiency of CHP, operating and maintenance costs are reduced while environmental performance is improved. The power and heat produced on site by the CHP system offsets purchases of electricity and fuel for boilers. The same reductions in purchased electricity that provide energy cost savings also reduce the environmental impact of hotel operations by reducing air pollution. CHP is a best practice for energy efficiency in hotels and will reduce your property's environmental impact through reduced electricity consumption.

Ensure the Availability of Hot Water and Electricity Supply

CHP provides a reliable source of energy to keep hotel guests comfortable and safe by producing simultaneous power and heat 24 hours a day, 7 days a week. CHP integrates seamlessly into existing heating and electrical systems, provides a steady supply of hot water, and can be configured to provide backup power in the event of a utility outage.

CHP in Use at U.S. Hotels

Ninety-eight hotels in the United States currently have CHP systems, representing more than 63 MW of electricity capacity. Of the existing CHP systems in the hotels sector, the majority are reciprocating engine systems operating on natural gas. Many of these systems were installed during the late 1980s and are continuing to operate reliably and efficiently today. In recent years, the mix of technologies used for CHP has broadened to include microturbine, fuel cell, and gas turbine installations.

The following case studies provide examples of recent successful CHP installations at hotels.

Embassy Suites Hotel, San Luis Obispo, California

The Embassy Suites Hotel in San Luis Obispo, California is a full-service hotel with 196 guest rooms, 11 meeting rooms, a pool and fitness center, and a restaurant and lounge. EPA CHP Partner PowerHouse Energy (PHE) installed an 85 kW CHP system at the hotel in July 2005.

The reciprocating engine-based system provides approximately 40 percent of the hotel's average electrical demand and more than 75 percent of the average thermal demand (including all domestic hot water needs during the summer months).

The Embassy Suites management chose to have PHE install, own, and operate the system, guaranteeing the hotel an energy savings on their electrical and thermal energy costs. The CHP system installed at the hotel provides typical savings of \$900 to \$1,200 per month, which should save Embassy Suites \$180,000 over the 15-year life of the energy service contract.

Starwood's Sheraton New York Hotel and Towers

EPA CHP Partner Starwood Hotels and Resorts Worldwide Inc. began operating a 250-kW fuel cell CHP system at the Sheraton New York Hotel and Towers, a 1,750-room facility and the brand's flagship property, in June 2005. The fuel cell was manufactured by EPA CHP Partner FuelCell Energy and is owned, operated, and maintained by PPL Corporation.

The CHP system—fueled by natural gas and located on a fourth-floor rooftop—provides about 10 percent of the hotel's electricity and hot water and is designed to supply backup electricity for a portion of the hotel. The system will save Starwood an estimated \$70,000 per year in energy costs. The New York State Energy Research and Development Authority (NYSERDA) provided a grant for the system through its Distributed Generation and CHP Program.

* For more information on these and other CHP Partners, visit our Partners' page at www.epa.gov/chp/chp_partners.htm

Options for CHP in Hotels

CHP technologies are flexible, providing a wide range of sizing options. The right CHP system for your hotel will be determined through consultations and analysis that will include a site-specific evaluation of your hotel's electricity and thermal loads.

CHP is typically sized to match the thermal demand of the hotel and usually provides 50 to 70 percent of a hotel's electricity needs. This approach to CHP system design, known as thermal base-loading, maximizes both the efficiency and the return on investment for CHP. Water heating is often the main thermal load met by a CHP system. Space heating, space cooling, laundry, restaurant, and pool heating loads can also be met by an appropriately sized CHP system. During the design phase of a new construction project or when adding or replacing boilers or chillers, hotels might want to consider installing CHP instead of new boilers or chillers to help offset capital equipment costs.

Hotels in the 100- to 300-room size range can use small 60 to 250 kW CHP systems with reciprocating engines, fuel cells, or microturbines that supply hot water for domestic hot water, space heating, and laundry needs. Larger hotels with central cooling systems can use larger CHP systems (i.e., 300 kW and greater) by incorporating absorption chillers that increase thermal energy recovery and provide both air conditioning and heating.

Because maintenance and service contracts are available for the type of CHP systems that are suitable for a typical hotel, no additional expertise or expense on the part of facility staff is required.

In addition to a CHP system, you might also want to consider a broader effort to benchmark the overall energy use of your hotel as part of a commitment to

Is My Hotel a Good Fit for CHP?

- **Do you have more than 100 rooms?***
- **Do you pay more than 7 cents per kWh for electricity?***
- Have you already implemented other energy efficiency measures?
- Are you concerned about rising utility costs?
- Do your guests complain of insufficient hot water?
- Has your hotel ever experienced a utility outage?
- Does your hotel have a central chilled water system?
- Are you planning to add new boilers or replace existing boilers?

If you answered "yes" to three or more of these questions, your hotel might be a good candidate for CHP.

****If the answer to either of these first two questions is "no," CHP probably will not be a strong economic or technical fit for your hotel. Please consider the many other energy efficiency measures available to hotels to decrease energy costs and improve facility operations. Resources for more information are listed on the back of this factsheet.***

comprehensive energy use reductions through ENERGY STAR®. In fact, pursuing energy efficiency improvements beforehand will help ensure that you have taken advantage of energy savings opportunities and that you will install a correctly sized system.



What Resources Are Available?

Technical Assistance

The CHP Partnership has developed services and tools to assist those considering implementing CHP at their facilities. Visit the Project Resources pages of our Web site at www.epa.gov/chp/project_resources.htm to learn more about the CHP project development process, whom to involve on your CHP project team, typical options for system financing, and other services EPA provides.

Project Resources

Take advantage of the CHP Partnership's up-to-date lists of state and federal incentives (e.g., rebates, tax credits, loans, grants) for CHP, along with lists of regulatory rules and rates that are advantageous to clean distributed generation. This information is updated twice per month on the Partner Resources pages of our Web site at www.epa.gov/chp/funding_opps.htm.

What's the Next Step?

EPA staff are available to answer your questions and provide specific technical support for your project. For information about how EPA can support your evaluation and implementation of CHP, contact EPA's CHP Team.

Call Tom Frankiewicz at (202) 343-9794 or e-mail at frankiewicz.thomas@epa.gov.

Public Recognition

EPA and the U.S. Department of Energy (DOE) recognize highly efficient CHP projects that achieve fuel and emissions savings over comparable state-of-the-art separate heat and power. Projects can receive an ENERGY STAR CHP Award, an EPA CHP Certificate of Recognition, or both. EPA accepts Award and Certificate applications continuously and presents these awards at key events. For more information on applying for an ENERGY STAR CHP Award or an EPA CHP Certification of Recognition for your hotel, visit www.epa.gov/chp/awards_certificates.htm.

EPA's ENERGY STAR provides guidance on pursuing strategic energy management programs in hotels and resources to benchmark your property's energy performance. See www.energystar.gov/hospitality.



ENERGY STAR is a government-backed program helping businesses and individuals protect the environment through superior energy efficiency.

The EPA CHP Partnership

The CHP Partnership is a voluntary program designed to foster cost-effective CHP projects. Through the Partnership, EPA engages energy users, the CHP industry, state and local governments, and other stakeholders in cooperative relationships to expand the use of CHP. Information about our services and program offerings is available on our Web site: www.epa.gov/chp.

