



Combined Heat and Power

Energy Savings & Energy Security for Resort Hotels and Casinos



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 resort hotel or casino. CHP can:

- Reduce operating costs and control rising energy costs.
- Ensure the availability of reliable electricity supply for guest comfort, security, and business continuity.
- 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 using the waste heat from onsite electricity production for heating or cooling, CHP increases fuel efficiency and decreases energy costs.

For hotel and casino resorts with more than 500 rooms, CHP system sizes typically range from 1 megawatt (MW) to 10 MW, depending on the size and energy requirements of the facility.

For information on CHP systems for smaller hotels, see the EPA CHP Partnership's companion fact sheet, *CHP for Mid-Size to Large Hotels*, available at www.epa.gov/chp/pdf/chp_hotelfs_web.pdf.

What Can CHP Do for You?

Ensure the Reliability of Electricity Supply

CHP provides a reliable source of energy to keep resort hotel and casino guests comfortable and safe by producing simultaneous power and heat 24 hours a day, seven days a week. Given that power outages can cost casinos more than \$1 million a day in lost revenue, the potential reliability benefits of CHP are significant. CHP integrates seamlessly into existing heating and electrical systems, providing a steady supply of hot or chilled water, and it can be designed to continue to operate and provide power in the event of a utility outage.

In addition, CHP systems provide high-quality power that can stabilize voltage and current sags, spikes, transients, and phase voltage imbalances. Insuring against these types of power quality problems can be particularly beneficial for computers, electronics, and security equipment at a casino.

Increase Energy Efficiency and Improve Environmental Performance

CHP reduces operating costs while improving environmental performance. The power and heat produced on site by a 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 and casino operations by reducing air pollution. CHP is a sound practice for energy efficiency in hotels and casinos, and it will reduce the property's environmental impact through reduced fuel consumption.

Reduce Energy Costs

CHP offers a solution to control spiraling energy costs and can be a central component of a fuel-hedging strategy for large resorts and casinos. The hospitality industry spends nearly \$4 billion per year on energy. Fuel prices are at a record high, and increasing energy costs are a major concern for resort hotels and casinos, 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.

A market analysis¹ of hotels and casinos developed by EPA's CHP Partnership shows that there are more than 500 large hotels and casinos in the United States that have energy characteristics suitable for current CHP technology. More than 170 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

CHP in Use at U.S. Resort Hotels and Casinos

At least 16 resort hotels and casinos with more than 500 rooms in the United States currently have CHP systems, and an increasing number of hotels and casinos are choosing CHP systems to meet their energy needs. Of the existing CHP systems in the hotel 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.

Harrah's Rio All Suite Hotel and Casino, Las Vegas, Nevada

The Rio All Suite Hotel and Casino is a large casino resort located in Las Vegas. The hotel includes 2,800 suites, 15 restaurants, theaters and lounges, gaming rooms, and other facilities.

The Rio's CHP system is the first CHP system at a Las Vegas casino. It was installed in 2004 to reduce the Rio's \$9 million annual energy bill. The CHP system consists of six natural gas-fired reciprocating engines with a total capacity of 4.9 MW. The system started operation on May 1, 2004, and generates 40 percent of the electricity, 60 percent of the hot water, and 65 percent of the heating requirements of the resort. By generating power and thermal energy more efficiently than the hotel can purchase from the local utility, the Rio saves \$1.5 million annually. The unit has been available and operating more than 95 percent of the time.

Seneca Niagara Falls Casino, New York

Having experienced the 2003 Northeast blackout, the Seneca Niagara Falls Casino, operated by the Seneca Gaming Corporation in Niagara Falls, New York, installed and began operating a new CHP system in December 2005. The system was designed to operate in the event of a utility outage, providing back-up power to allow the Seneca Casino to remain operational in the event of a catastrophic failure of the electric grid. The CHP plant utilizes three 2 MW natural gas-fueled reciprocating engine/generator sets to generate approximately 6 MW of power. During peak load, the CHP system meets approximately 73 percent of the casino's electricity needs.

The CHP system was sized to meet the thermal load of the facility, providing space heating and cooling, as well as domestic hot water for the casino. During the summer months, the system is expected to meet 100 percent of the casino's thermal needs and is expected to pay for itself within four years.

Options for CHP in Resort Hotels and Casinos

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

CHP is typically sized to match the thermal demand of the hotel or casino and usually provides 50 to 70 percent of a facility'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. Space cooling represents the main thermal load met by a CHP system at a large hotel or casino. Space heating, water heating, 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, resort hotels and casinos might want to consider installing CHP instead of new boilers or chillers to help offset capital equipment costs.

Resort hotels and casinos with more than 500 rooms can generally use 1 to 10 MW CHP systems with industrial gas turbines or large reciprocating engines to produce power for the facility's baseload needs, and the high temperature exhaust can be converted to steam in heat recovery steam generators to provide both air conditioning and heating.

Various types of maintenance and service contracts are available for CHP systems, including comprehensive maintenance, service, and operations. Alternately, existing staff can be trained to perform maintenance for the system.

What Resources Are Available?

Technical Assistance

The CHP Partnership has developed services and tools to assist those considering CHP for their facilities. Visit the Streamlining Project Development 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), along with lists of regulatory rules and utility rates that are advantageous to CHP. This information is updated twice per month at www.epa.gov/chp/funding_opps.htm.

Public Recognition

EPA and the U.S. Department of Energy recognize highly efficient CHP projects that achieve fuel and emissions savings over comparable state-of-the-art separate heat and power with an ENERGY STAR CHP Award. EPA accepts award applications continuously and presents awards at key events. For more information on applying for an ENERGY STAR CHP Award for your hotel, visit www.epa.gov/chp/public-recognition/awards.html.

Is My Hotel or Casino a Good Fit for CHP?

- Do you pay more than 7 cents per kilowatt-hour for electricity?
- Are you concerned about high or rising utility costs?
- Are you considering adding or replacing backup generators?
- Does your hotel or casino have a central chilled water system?
- Are you planning an expansion, new construction, or a major retrofit of your hotel or casino's HVAC system?
- Are you interested in reducing the environmental impact of your hotel or casino's operations?

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

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 us. Call Neeharika Naik-Dhungel at (202) 343-9553 or e-mail her at naik-dhungel.neeharika@epa.gov.

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.

