combined heat & power at an office building

BP Helios Plaza

4.3 MW CHP Application

Project Profile

Quick Facts

Site location: Houston, TX

Industry Type: Office/Data Center

CHP equipment:
One combustion turbine (Mercury 50) with turbine inlet cooling, a heat recovery steam generator, an absorption chiller, a chilled water storage tank

Fuel: Natural Gas

Generating Capacity: 4.3MW

Absorption Chiller: 1,350 tons

Chilled Water Storage: 4,000 ton-hr

Key Driver:
Energy Security & Reliability

Site Overview

Located 20 miles west of downtown Houston, BP Helios Plaza is a six story, 400,000 square feet office building that houses a data center and a two-story commodity trading floor. Real time trading of electricity, natural gas and other commodities are conducted at the facility, thus necessitating a high degree of energy security and reliability. The Helios Plaza was designed to meet a LEED platinum rating through resource conservation and conscientious construction practices. At the heart of the building is a 4.3 MW combined heat and power system that provides all of the building's energy needs. The site has several other sustainability features such as rain water harvesting, native and adaptive plants, day lighting, variable air volume systems, cool roof, use of recycled content, regional materials and FSC certified wood in the construction process.

Project Description

The CHP plant consists of a Mercury 50 gas turbine, manufactured by Solar Turbines, with a Heat Recovery Steam Generator (HRSG), a hot-water driven absorption chiller and selective catalytic reduction (SCR) technology. Helios Plaza has two separate uninterrupted power supply systems that are independent of each other, both with 3-500kVa modules. The CHP plant provides the primary electricity for the building, while the two feeds from the electric grid serve as a backup. The hot-water driven absorption chiller provides for all of the building's chilled water needs, with the electric centrifugal chiller and the thermal energy storage tank, serving as a backup. The degree of redundancy in the design was necessary to mitigate the risk of a power outage, which would disrupt BP's trading operations. Superior controls, variable air-volume systems and an underfloor air distribution system resulted in the building requiring minimal heat, which is provided by electric resistance heaters. Due to energy efficient lighting, a high performance exterior skin, cool roof and an on-site CHP system, the Helios Plaza performed 34.1% better than the ASHRAE 90.1, 2004 standard in terms of energy cost savings. This translated to nine LEED points under EA Credit 1: Optimized Energy Performance, which was critical to obtain the LEED platinum rating. The CHP system provided the necessary energy security and was critical in cost-effectively achieving the LEED platinum rating for the BP Helios Plaza.

CHP Drivers

Key drivers for the installation of CHP at the hospital were energy security and reliability. During the design phase it was determined that CHP was far superior to provide secure and reliable power (critical to BP) than the electric grid. A secondary driver for the installation was the desire to achieve the LEED platinum rating in a cost-effective manner. The on-site natural gas turbine, with the waste heat recovered by an absorption chiller provided for all of the site's electricity and chilled water needs, thereby ensuring energy savings and environmental benefits.

Lessons Learned

- Energy security and reliability provided by the CHP plant, ensured that the facility remained unaffected by rolling blackouts, associated with the grid.
- Project management of multiple contractors, entailed close involvement of several facility personnel during the startup and commissioning of the CHP Plant.
- Very little maintenance was needed for the hot water absorption chiller that caters to all the cooling needs of the building.
- Interconnection requirements to the electric grid, in order to facilitate sale of power was onerous and time-consuming.
- Paybacks associated with the CHP installation were shortened due to inclusion of avoided financial losses that could have occurred, if the site had depended solely on the electric grid during the blackouts.
- The onsite CHP system was integral in cost-effectively achieving the LEED platinum rating.

For more information –
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Energy security and reliability, highly critical to BP's operations, were key drivers for the installation of the CHP plant. Rolling blackouts that occurred in February 2011 in Texas due to extreme cold weather caused grid failure in areas surrounding the facility, but did not affect the BP Helios Plaza, as the CHP plant operated in island mode. The "avoided financial impact" during the black-outs aided in shortening the payback associated with the CHP plant.