PACIFIC

U.S. DOE

CHP Technical Assistance Partnerships

PROJECT PROFILE

Transamerica Pyramid Building

1-MW CHP System

Quick Facts

LOCATION: San Francisco, CA
MARKET SECTOR: High-rise Development
FACILITY SIZE: 600,000 square feet
FACILITY PEAK LOAD: 2.1 MW
EQUIPMENT: 1 MW (two 500-kw Waukesha VGF L36GSID natural gas-fired v-12 engine systems, 800 HP each), one 300-ton absorption chiller
FUEL: Natural gas
USE OF THERMAL ENERGY: Space heating, domestic hot water and chilled water
CHP TOTAL EFFICIENCY: 64 -72%
ENVIRONMENTAL BENEFITS: Reduced carbon footprint
TOTAL PROJECT COST: $4.6 million
REBATES: $600,000 (California's Self-Generation Incentive Program)
ANNUAL ENERGY SAVINGS: $700,000-$800,000
PAYBACK: 5 years
CHP IN OPERATION SINCE: 2009

Site Description

The 48-story Transamerica Pyramid Building is the tallest and most recognizable building in the San Francisco skyline. It was built in 1972 on the former location of the historic Montgomery Block. Today, the building houses offices and retail space but is no longer headquarters of Transamerica Corporation for which the building is named. The Transamerica Pyramid Building uses all of the power generated in-house and does not export power back to the utility grid. The installation is required by the interconnection agreement to power down upon grid failure, but could in the future be upgraded for blackout ride-through capability.

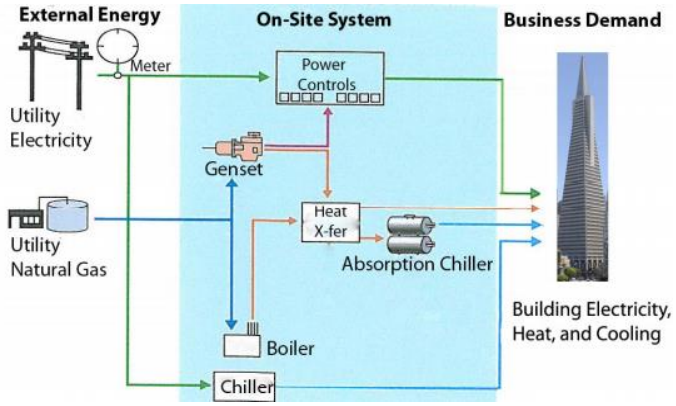
Reasons for CHP

The addition of the on-site combined heat and power (CHP) system was initially driven by Transamerica's desire to eliminate the need for city steam and reduce electricity demand from the local utility. Using less electric power during peak times enables the building to buy power at a lower average rate. The system is responsible for generating approximately 70% of normal daytime electricity consumption and 100% of its heating, chilled water and domestic hot water needs. Other reasons that Transamerica chose CHP included:

- Reduces operating costs
- Reduces GHG emissions
- Increases energy efficiency
- Potential for improved energy reliability for tenant's critical infrastructure

CHP Equipment & Operation

Installed in 2007, the Transamerica CHP system is comprised of two 500-kW Waukesha reciprocating engines paired with a 300-ton York absorption chiller. The system is maintained by GI Energy, ABLE Engineering Services and is owned and operated by Transamerica Pyramid Properties, LLC. Approximately half of the recovered heat energy from the engines goes to power the absorption chiller with the other half going to the building's space heating and hot water requirements. The York unit has a 300-ton capacity operating on the heated jacket water and recovered exhaust heat from the engines.



"The economic and environmental benefits of installing the CHP system were compelling. The system is primarily responsible for the Pyramid's certification as prestigious LEED Platinum."

- Mark Novack, Real Estate Portfolio Manager, Aegon USA

Transamerica operates the CHP system according to two unique schedules during the workweek: normal business hours, Monday – Friday, 6:00 a.m. to 6:00 p.m., and a weekday evening schedule. The CHP system does not operate on weekends due to a lack of workers to oversee the system. During normal business hours, the system operates at full capacity with both engines online, providing approximately 1 MW for the building's electrical loads and the absorption chiller supplying a portion of the building's cooling requirements. A chilled water plant, composed of three additional electric chillers (total of 1,160 tons), supplies the remaining building cooling needs. The CHP system produces a combined electrical and thermal efficiency of approximately 72% during the day. The weekday evening schedule entails running only one engine in conjunction with the absorption chiller. The off-hours load drops down to only 400 kW. The engine runs at part-load capacity of 200-300 kW output in order to meet a utility requirement stating that Transamerica must always draw at least 100 kW from the grid. The absorption chiller is able to meet 100% of the building's evening cooling demand, thereby allowing the electric chillers to be turned off at night. Night time overall system efficiency is approximately 64%.

Lessons To Share

Transamerica is satisfied with their on-site CHP system's operations and reliability, but like most complicated projects, there were a few difficult lessons learned:

- Locating the CHP system in the basement required installing chilled-water cooling coils to remove surplus engine heat from the basement.
- Space to locate the absorption chiller close to the engine units was unavailable, so instead, heat is transferred from the engine unit via the jacket water where it travels the perimeter of the underground parking unit to the York chiller located across the building and one floor away.
- The CHP feasibility study over-predicted the hours of operation, which decreased project economics (i.e. ROI)
- Replacement parts and modifications caused by operating higher than required pressures and temperatures negatively affected ROI
- A more efficient engine jacket water piping system interconnected with the absorber chiller and heat exchangers could have been designed.
- On-site engineering staff should have been better trained in the operations of the CHP system.

For More Information

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