

POWER PROFILE

REDUCING OPERATING COSTS WITH URBAN COGENERATION

POWER NEED

As the fourth largest office building in New York City, One Penn Plaza operates on one of the most constrained electrical grids in the U.S. Located in Midtown Manhattan, the 57-story building is situated above Penn Station at 34th Street and 7th Avenue, adjacent to Madison Square Garden. It has a total peak electrical demand ranging from 10 to 11 MW in the summer and 6.5 to 7 MW in the winter.

The real estate investment trust (REIT) that owns One Penn Plaza needed to provide a reliable source of power to its tenants that would also contribute to the goals of both New York City and New York State to reduce grid demand, increase energy efficiency and reduce energy costs: New York State's initiative for 15 percent energy reduction by 2015 and Mayor Michael Bloomberg's goal of adding 80 MW of distributed generation to New York City by 2030.

SOLUTION

The REIT created an LLC to manage its on-site energy plant and contracted with energy services company GI Energy to install a combined heat and power (CHP) system in 2009 to sell power and steam directly to the tenants of One Penn Plaza. The tenants receive a monthly energy bill from the LLC as specified in their leases, and the price of their utilities mirrors the cost of those provided by the local utility, Con Edison. "The difference lies in the cost to produce it," says John Brogan, senior vice president for GI Energy, which developed and operates the plant.

The result is a state-of-the-art 6.2 MW CHP plant. Three Cat® 2,055 kWe gas generator sets are installed with heat recovery steam generators (HRSGs) that are all housed in a sound-attenuated enclosure on the roof of a 12th floor setback at One Penn Plaza. The housing is two stories tall and weighs 650,000 pounds. The generators are tied to the electrical services of the main building. Waste heat from the engines is processed through the HRSGs to produce high-pressure steam, which

is then used to offset the building's steam load. The steam is used in the summer months to cool the building with steam turbine chillers. In the winter, the steam preheats domestic water and conditions the temperature of secondary water. The cogeneration plant produces just under 6 MW of power in the summer and 4.5 MW in the winter, which amounts to more than half of the electrical demand for One Penn Plaza during the same time periods.

"Because we are using natural gas as our fuel source, and because we have highly reliable engines, we can actually produce the electricity for a fraction of what it would cost to buy it from a centralized utility," Brogan says. On average, the REIT earns between \$10,000 to \$12,000 a day.

Peak Power One removes 20 to 25 million kWh per year from the city's power grid, while providing 60 percent of the electricity and 30 percent of the steam requirements for One Penn Plaza. The efficiency of the CHP system stands in contrast to power generated at the utility, where power arrives at the building at 40 percent of each volt generated from the source. The on-site power supply significantly reduces the building's carbon footprint – roughly 2,800 metric tons are offset every year. By capturing waste heat from the generators and reusing it to power both heating and cooling systems for the building, the CHP system achieves a combined efficiency of more than 80 percent, which is more than double the efficiency of power supplied by the grid. "A plant of this kind has never been done before – it's one of a kind," says Brogan.

RESULTS

Cat dealer H.O. Penn served as a primary partner with GI Energy on this project, both on the front-end sales and also for the long haul through a five-year maintenance and service agreement.



CUSTOMER:

[GI Energy](#)

LOCATION:

New York, New York, U.S.A..

SCOPE OF ENGINE USE

- Three Cat® 3520C Generator Sets

CAT DEALER:

[H.O. Penn](#)

“We have gone through the initial start-up phase with this plant and have had a lot of interactions with people at many different levels of H.O. Penn,” Brogan says. “From senior management to the field service coordinators, to the actual service technicians – it has really been a team effort.”

“And, it takes a full team,” says Brogan. “If I had only the salesman, and a lot of Caterpillar’s competitors only have the salesman, it doesn’t get you to the finished product you are looking for. So, you really need to have everybody from sales to the technical side, and once your plant is running, you have to have a qualified service team that can support it. And, if you have all of that together, the whole project is completed successfully, and you have a plant that is making a lot of money for its owner.”

During Hurricane Sandy in 2013, One Penn Plaza barely missed being flooded, unlike other parts of New York City. “We were pretty fortunate this plant did well in the storm,” Brogan says. “Con Edison steam wasn’t working, and we were able to heat part of the building with hot water that we were already supplying from the cogen plant.”

One of the many advantages of the cogeneration plant is that it can run independently and supply some of the building’s power during a major storm. “As long as you have natural gas, this system was designed to be turned on and run without the utility being there,” Brogan says.