

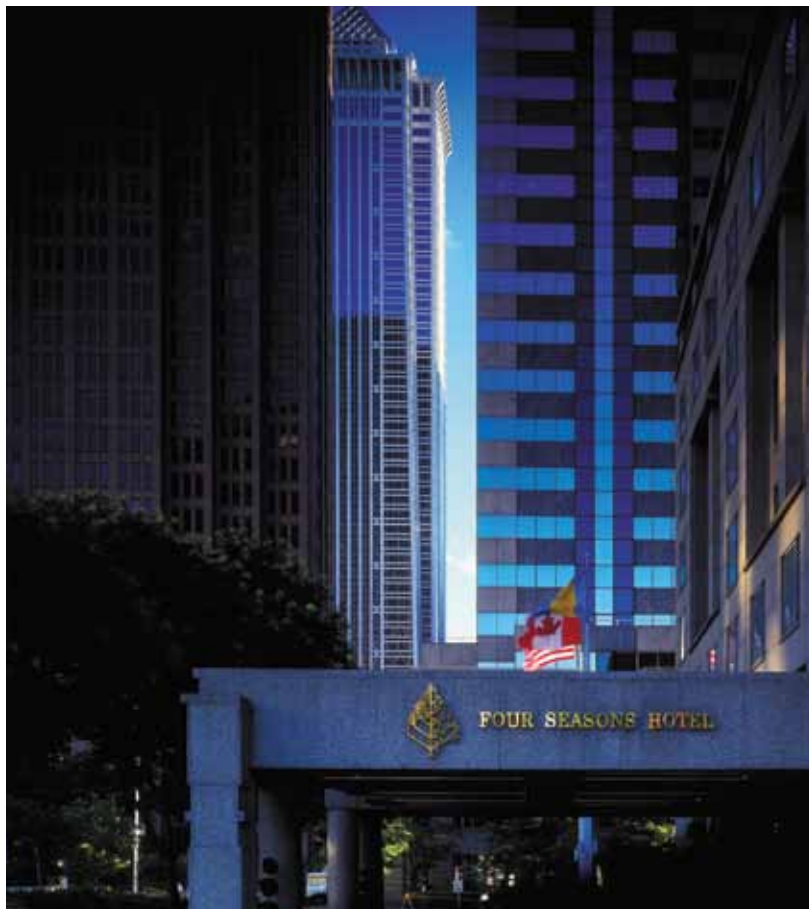
## Four Seasons Hotel Philadelphia

As a five-star luxury hotel, the world-renowned Four Seasons Hotel Philadelphia uses a tremendous amount of energy each day for cooking, heating, lights, laundry, showers, swimming pools, and more. Management of this opulent, 364-room Philadelphia icon, wanting to gain control of energy costs and reduce greenhouse-gas emissions, turned to E-Finity Distributed Generation to install Capstone MicroTurbines® to generate the hotel's own onsite power.

In October 2009, the eight-story hotel had three Capstone C65 ICHP natural-gas microturbines installed on its roof at One Logan Square in downtown Philadelphia.

The microturbines' combined heat and power (CHP) technology allows the hotel to generate nearly 200kW of electrical power, which takes care of 30 percent of the hotel's overall electricity needs. Exhaust heat from the microturbines is captured and used to heat water for laundry and other hotel operations. In fact, the energy-efficient CHP application provides 100 percent of the building's day-to-day domestic hot water and 15 percent of its heating needs.

Before installing the C65 microturbines, the hotel relied heavily on the city of Philadelphia's steam loop and the local electric grid to meet its energy needs. Today, the hotel uses natural gas to produce its own electrical and thermal power.



### At a glance

#### Location

Philadelphia, Pennsylvania, USA

#### Commissioned

October 5, 2009

#### Fuel

Natural gas

#### Technologies

- 3 C65 ICHP Capstone Microturbines.
- Heat Recovery Modules installed on each C65 capture the microturbines' waste heat as part of a CHP application.

#### Results

- Saved US\$80,000 during the first 2 months of microturbine operation.
- 195kW of electricity.
- More than 1.2MM BTU/hour of recovered thermal energy
- Ultra-low emissions (< 9 ppmv NOx at 15% O<sub>2</sub>).
- Electricity costs 20% less than utility power.
- The CHP system provides 100% of the hotel's domestic hot water needs, 30% of electrical needs, and 15% of heating needs.
- Quiet – only 65db at 10 meters.
- Small footprint – 3 C65s with heat exchangers fit in 37-square-meter space on rooftop.



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*— Marvin Dixon, Director of Engineering,  
Four Seasons Hotel Philadelphia*

“There is a great link: buy cheap gas, own your own turbine, and produce your own electricity,” said Marvin Dixon, Director of Engineering at Four Seasons Hotel Philadelphia. “Because we buy third-party transportation gas, we can shop around for the best rate. This has made electricity from the microturbines 20 percent cheaper than what we could get from the utility.”

The hotel reconfigured its hydronic heating loop into a system that captures heat from the microturbines and distributes it throughout the building.

“This new process with microturbines allows for more control over heat distribution and BTUs,” Dixon said. “With such a highly efficient process, the hotel is able to squeeze every dollar out of each BTU. Instead of dumping rejected heat into the atmosphere, we can reuse it. In the first two months of operation we saw a cost avoidance of over US\$80,000.”

Aesthetically, the system is quiet and takes up minimal space, a key reason the C65 microturbines were selected over reciprocating technology. With a noise output of only 65 decibels at 10 meters, the microturbines are not a nuisance to the Presidential Suite guests directly below.

“Reciprocating engines have to be rebuilt at 22,000–23,000 hours, have oil replaced regularly, consist of lots of moving parts, and have high vibration and noise. We can’t have noise at a hotel – that would be a disaster,” Dixon added.



Three natural gas C65 ICHP Capstone microturbines provide electrical and thermal power at the Four Seasons Hotel Philadelphia.

In addition, the energy efficiency of reciprocating engines is often less than 30 percent. A Capstone C65 microturbine in a CHP application boasts energy efficiencies greater than 80 percent.

Since the units are small and modular, they easily fit in a 37-square-meter space on the hotel’s roof. The rooftop microturbines, which sit amid prime metropolitan real estate, are also ultra-low in emissions (< 9 ppmv NO<sub>x</sub> at 15% O<sub>2</sub>) – making this onsite power generation system a clean-and-green, environmentally friendly option.

Dixon expects more hotels will utilize the proven technology. In fact, the Four Seasons Hotel Philadelphia plans for a Phase II installation that will include two additional Capstone microturbines and an absorption chiller to meet the growing hotel’s future energy and air-conditioning needs.

“Four Seasons is a leader in the community and accustomed to setting the standard for future generations,” Dixon said. “The microturbine installation is a step in the right direction in helping Philadelphia become a more sustainable city.” ■