



The Challenge

Masonic Village is a continuing care retirement community, children's home, and community service organization in Elizabethtown, Pennsylvania. Having first opened its doors in 1910, the campus has grown today to a 1,400-acre complex that features retirement living apartments, cottages, and townhomes that provide a range of services including nursing and personal care, memory care and home and community-based services for its more than 2,000 residents who are cared for by more than 1,850 staff members.

For 90 years, the complex's old coal plant had burned in excess of 5,000 tons of coal each year to produce heat for laundry and space heating. In the early 2000s, Masonic Village officials decided it was time to replace the campus' inefficient coal-fired steam system—and the high emissions associated with burning coal—with something more efficient and effective. In 2002, they made the move to combined heat and power (CHP) for their heating and electric needs, and it has become the longest running system of its kind in the U.S.

The Solution

After conducting deep research, Masonic Village decided to install a system featuring five C60 low-emission Capstone microturbines that produce a combined 300kW of electricity. The microturbines are designed specifically for CHP applications. For five years, the natural-gas microturbines supplied existing base-load hot water needs, and simultaneously created electric power for the campus.

Delighted with the with the performance of the original natural-gas C60s, Masonic Village officials agreed in 2007 to upgrade the CHP microturbines to C65 ICHP microturbines. Working with local Capstone

Power Profile

Customer

Masonic Village

Location

Elizabethtown, Pennsylvania

Commissioned

Originally installed in 2002; upgraded in 2007, with additional engine overhauls in 2012 and 2017

Fuel

Natural Gas

Technologies

■ Six C65 ICHP microturbines

Capstone Turbine Distributor

E-Finity Distributed Generation



"The microturbines enable Masonic Village to fulfill its commitment to energy efficiency and environmental stewardship, which also impacts our overall not-for-profit mission. The cost savings and rebates help offset the declining government reimbursements Masonic Village receives for resident care and services. We provided charitable care and services statewide worth \$33.4 million in 2019 alone."

— Patrick Sampsell, Chief Environmental Officer
Masonic Village



Capstone microturbines generate electricity and heating at Masonic Village, a 1,400-acre complex serving more than 2,000 residents since 1910.

distributor E-Finity Distributed Generation, the retrofit increased the on-site power plant's thermal- and electrical-energy efficiency virtually overnight. In fact, the retrofit was so efficient that the array of microturbines was only down for a total of eight hours.

In addition to the five C65 ICHP microturbines, E-Finity and Capstone also installed the Capstone-designed integrated Heat Recovery Modules on each microturbine, as well as the Capstone Service Network that allows real-time remote monitoring, alarming, and troubleshooting of the power plant via the Internet.

The original installation placed third-party heat exchangers beside each turbine. With the upgrade, the Capstone Heat Recovery Modules (HRMs) were relocated to sit on top of each microturbine, so the entire system takes up much less space.

The 2007 upgrade also included a five-year Capstone Factory Protection Plan (FPP); which provided a second complete overhaul in 2012 and a third major overhaul in 2017.

After nearly two decades of investing in clean energy, Masonic Village now produces 23-25% of its electricity using a mix of solar panels and microturbines. Six microturbines currently generate 8-10% of the campus' electricity. Meanwhile, the heat created as a by-product of the microturbines, heats water for a portion of resident apartments and the Masonic Health Care Center, reducing the use of gas boilers.

The Results

The reliable, clean-and-green turbines drastically lowered emissions and improved energy efficiency at the campus.

Today's system, comprised of six C65 ICHP microturbines, produces 390kW, which is 25kW more than the original Capstone installation. The system upgrades have provided a 47% increase in net heat recovered, and an overall system efficiency of approximately 83%.

To date, the system has produced 50 million kWh and reduced greenhouse gas emissions by 21,000 tons. When compared to the original coal-fired plant, the Capstone emissions are so low, the system has achieved the equivalent of removing over 4,000 cars from the road every year or planting 25,000 acres of forest.

With 18 solid years of operation, the system is approaching 900,000 run hours and counting. ■

Capstone C65 ICHP Microturbine



A C65 provides up to 65kW of electrical power while the UL-Certified C65 ICHP provides up to an additional 150kW of thermal power for CHP and CCHP applications.