At a glance

Location

Waynesburg, Pennsylvania, USA

First Microturbine Commissioned

2004, then updated 2009

Fuel

Natural gas – same pipeline gas pumped through the Crayne Station.

CHP Technologies

- 2004 – 3 Capstone C60 ICHP microturbines installed.
- 2009 – Microturbines upgraded to Capstone C65 ICHP units. Heat exchangers on top of each microturbine capture the microturbines' waste heat.

Results

- Capstone microturbines provide electricity and heat to all buildings.
- The microturbines also produce heat that warms raw natural gas chilled during the decompression process.
- Efficiency of the microturbine-based combined heat and power (CHP) system is about 85%.
- Captured microturbine heat raises the temperature of compressed natural gas to 85°F) from a chilly 35°F.
  The warmed and decompressed natural gas fuels 2 7,800-horsepower Solar engines that run the station's compressors.
- Free microturbine heat eliminates the need for an otherwise required boiler and boiler fuel. In essence, the 3 C65 ICHP Capstone microturbines act as a zero-fuel, zero-emission, 1 million BTU boiler.

Dominion Transmission Crayne Compressor Station

Dominion Transmission, which operates 7,800 miles of natural gas pipelines in the Eastern United States, made a bold move – it completely disconnected one of its transmission stations from the local utility.

"We had found a more efficient, more reliable way to provide power to our station. Why wouldn't we go with it?" said the Dominion Project Manager at the time. The more efficient and reliable power source was three 60kW Capstone MicroTurbines® that provided all electricity to the station.

In addition to reliability, the microturbines at the station saved Dominion a significant amount of money, according to a September 2005 article in *Distributed Energy* magazine. To provide utility power to the site, United Electric Corp. would have to run power lines from a station 15 miles away at a cost of US$1.35 million and a rate of US$0.116 per kW-hour. Instead, by installing Capstone microturbines, Dominion saved more than US$1 million and controlled its own power source. At the same time, the clean-and-green microturbines, which emit low levels of nitrogen oxides and nearly no sulfer dioxides, allowed Dominion to easily pass air-quality tests.

Dominion Transmission's Crayne Compressor Station in Pennsylvania where three Capstone C65 ICHP microturbines provide all electricity and heat for the 5-acre site.

Capstone®

Crayne Compressor Station – A CHP Model

In 2004, three Capstone C60 ICHP microturbines were commissioned at the Crayne Compressor Station in Waynesburg, Pennsylvania. In 2009, working with Capstone distributor E-Finity Distributed Generation, Dominion upgraded the microturbines to C65 ICHP units.

Now, the fleet currently includes 46 Capstone microturbines, which together produce more than 3MW of onsite electricity at 10 compressor station sites throughout the Eastern United States. At the Crayne station, three microturbines provide electricity and heat to all buildings and excess heat warms raw natural gas chilled during the decompression process.

Crayne Station is the fifth Dominion site to feature microturbines, and the first to install microturbines in a CHP application. The microturbines, which produce about 130kW of power, don't require any special fuel – they operate on the same pipeline natural gas that's pumped through the Crayne Station.

Three Capstone C65 ICHP microturbines operate on the pipeline natural gas that's pumped through Crayne Station. Heat exchangers on the top of each microturbine capture waste heat used in the decompression process.

Heat exchangers on the top of each microturbine capture the microturbines' waste heat. The captured microturbine heat is used to raise the temperature of compressed natural gas to 85°F from a chilly 35°F. The warmed and decompressed natural gas fuels two 7,800-horsepower Solar engines that run the station compressors. Each day, up to 750-million-cubic-feet of raw natural gas pass through the station.

The free microturbine heat eliminates the need for an otherwise required boiler and boiler fuel. In essence, the three C65 ICHP Capstone microturbines act as a zero-fuel, zero-emission, 1 million BTU boiler.

"The CHP with Capstone microturbines run really well," said Jerry Todd, Dominion Transmission Project Manager and Design Engineer. "The microturbines use less gas and produce more heat than the boilers. We're generating our own electricity and heat for the system. In essence, the heat for the hot water is free."

The Capstone microturbines replaced an old back-up generator, which Todd described as a "polluter" and "very noisy."

"We were going to have to overhaul it or replace it," he said.

Efficiency of the microturbine-based system is about 85 percent, according to Todd. Efficiency of the old reciprocating engine was only 30 percent. "The boiler was in the 40 percent range," Todd added. "With the microturbines, we've more than doubled our efficiency and don't use as much fuel."

"Dominion installed Capstone microturbines for reliability, economic, and environmental reasons," said Jeff Beiter, E-Finity Managing Partner. "As Dominion expands its operations, they're continuing to look for ways to reduce emissions. Capstone microturbines are the answer."

Todd said payback on the efficient and reliable Capstone microturbine system is about five years.

"Some stations with microturbines are saving as much as US$3,000–US$4,000 per month on electric costs," he said. ■

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