Dominion Transmission Compressor Stations

At a glance

Location

Eastern USA

First Microturbine Commissioned

2004, then updated 2009

Fuel

Same pipeline natural gas pumped through the Crayne Station.

CHP Technologies

- 2004 – Three 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 percent.
- Captured microturbine heat raises the temperature of compressed natural gas to 85 degrees Fahrenheit (F) from a chilly 35 degrees F. The warmed and decompressed natural gas fuels two 7,800-horsepower Solar engines that run the station compressors.
- 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.

In 2001, Dominion Transmission, which operates 7,800 miles of natural gas pipelines in the Eastern United States, made a bold move – it completely disconnected its Ardell transmission station 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 Ardell 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 $1.35 million USD and a rate of $0.116 per kW-hour USD. Instead, by installing Capstone microturbines, Dominion saved more than $1 million USD 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

Eight years later in 2009, a total of 10 Dominion Transmission stations will rely on 44 Capstone microturbines that produce more than 2.7MW of on-site electricity. At one of the stations – Crayne Compressor Station in Waynesburg, Pennsylvania – three Capstone microturbines provide electricity and heat to all buildings and produce heat that warms raw natural gas chilled during the decompression process.

In 2004, Dominion installed three Capstone C60 ICHP microturbines at Crayne Station. Four years later, working with Capstone distributor E-Finity Distributed Generation, Dominion upgraded the microturbines to C65 ICHP units.

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.

Heat exchangers on the top of each microturbine capture the microturbines' waste heat. The captured

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.

microturbine heat is used to raise the temperature of compressed natural gas to 85 degrees F from a chilly 35 degrees 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 $3,000 to $4,000 USD per month on electric costs," he said. ■

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