



First 7FA.05 gas turbines go commercial at Xcel Cherokee

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Three new 2 × 1 combined cycles with the latest 7FA.05 gas turbine technology from GE, two in New Jersey and Xcel Energy's 569-MW unit at the existing Cherokee Generating Station in Denver, were in the running to declare the earliest commercial operating date (COD). Xcel won with a COD of Aug 20, 2015 (photo).

The short three months after first fire May 19 is significant because of the summer peaking period and the location of Cherokee and its importance to the Denver grid. According to Gerald Kelly, Xcel Project Manager, 17 transmission lines tie in at the plant.

The facility also made use of a grey market D11 GE steam turbine owned by the company.

Kelly credits significant investment in "preventative measures" for the smooth commercialization period. "We had both GT units run through full-speed/no-load tests at the factory, conducted full-capacity performance tests on balance-of-plant critical pumps, stroke-tested every critical valve, witnessed rotor stacking and balancing tests, dedicated 1½ people to oversee the quality of the EPC work, and sent QA/AC specialists and engineers to factories as far as Korea to oversee the welding and fabrication of the HRSG components."

Both GTs were fully field performance tested at a few megawatts above their guaranteed output numbers, around 100 Btu/kWh below the design heat rate, and lower than the 9 ppm guaranteed NOx emissions down to 40% load.

"We checked every wire, every control loop and logic, every instrument, thousands of components, and ran every pump, ahead of first firing and it was all time and money well spent," claims Kelly, "plus the D11 is humming, no vibration issues, partly because we upgraded to GE's advanced seal components." Kelly also lauds GE's diagnostics staff, onsite and remote specialists. "If we went down, we were never down for more than an hour or two."

Perhaps most notable is that testing of the units was in synch with the normal production schedule from dispatch. "We made sure to closely coordinate with our dispatchers by having a weekly plan and informing them a day ahead how we needed to operate during the commissioning period." The bargain was that dispatch would have the unit earlier if production could be coordinated with testing. "Denver's summer load is around 5000 MW," explained Kelly, "we may have given the dispatchers some white knuckle rides swinging 300 MW every few minutes to check ramping rates."

It's easy to see why. Cherokee, once a coal-fired plant, is located in close proximity to Denver's urban core. Its location in the grid is as important, perhaps more so than its output. Xcel's "three-shaft rule" governed the transition into the new plant operation. Originally, the plant had three small units totaling 365 MW and one larger 352-MW unit. The three-shaft rule postulates one unit in an outage (getting preventive maintenance), one in a potential forced outage situation, and one spinning at all times to supply load stability to the grid.

Today, the three small units have been retired; however, one was converted to a synchronous condenser for grid VAR support. The last small unit was retired when the combined-cycle unit went commercial. The last remaining large coal unit at Cherokee will stop burning coal and only run on natural gas beginning in 2017. The combined cycle counts as one shaft! Going forward, outages at Cherokee must be precisely coordinated to achieve the necessary reliability and availability performance for the Denver metro area.

"One issue faced was transmission constraints when the combined-cycle plant was fully loaded during commissioning and the third small coal unit was operating," Kelly noted, "There were times when we had to restrict coal-plant output." The restructuring of Cherokee to a gas plant with a new combined cycle was part of the [Colorado PUC's Clean Air Clean Jobs Act plan](#).