

Illinois EPA approves permit for 380-MW expansion of Invenergy Nelson plant

Illinois agency rejects U.S. EPA arguments over BACT limits

10/10/2016 by Barry Cassell

On Sept. 27, the Illinois Environmental Protection Agency's Bureau of Air issued a construction permit to **Invenergy Nelson Expansion LLC** for two additional units at the Nelson Energy Center located near Rock Falls.

In June 2015, the Bureau of Air received a construction permit application from Invenergy to construct two peaking units. This plant currently functions as an intermediate load facility with two natural gas-fired combined cycle turbines, each with a nominal capacity of 300 MWe. The proposed project would add two simple-cycle turbines to the plant, each with a nominal capacity of 190 MWe. These units would be dual fuel fired (natural gas and ultra-low sulfur diesel) and developed to provide peaking generation.

During a comment period, the U.S. EPA told the state agency that the Best Available Control Technology (BACT) determination for NO_x emissions does not sufficiently evaluate lower NO_x BACT limits. To comply with BACT requirements for NO_x emissions, the permit would require the use of Dry low-NO_x (DLN) combustion technology when firing natural gas to achieve a NO_x emission limit of 9 parts per million by volume (ppmv) in the exhaust, adjusted to 15% oxygen, or the alternative limits expressed in terms of fuel heat input to the turbine, in pounds per million Btu (lb/mmBtu), higher heating value (HHV). When firing ultra-low-sulfur diesel, the permittee must use low-NO_x combustion technology and water injection to achieve a NO_x limit of 42.0 ppmv at 15% oxygen (equivalent to 0.164 lb/mmBtu, HHV).

However, the U.S. EPA said the permit record does not show that the Illinois EPA adequately evaluated the feasibility of lower NO_x emission limits when the turbines are firing natural gas. Specifically, a project summary does not list the 2.5 or 5 ppmv NO_x BACT limits listed in the RACT/BACT/LAER Clearinghouse (RBLC) for natural gas-fired simple cycle turbines. U.S. EPA considers the use of the combination of DLN combustion technology and Selective Catalytic Reduction (SCR) to achieve NO_x emission limits less than 9 ppm from simple cycle turbines to be feasible in most cases unless a complete top-down BACT analysis can demonstrate otherwise. Based on publicly available information, it said it believed that a NO_x BACT limit of 5 ppm or less for simple cycle (peaker) turbines is achievable, and source test results have confirmed that simple cycle turbines can comply with NO_x limits under 5 ppm.

Said the Illinois EPA in response: "The important distinction that needs to be made for combustion turbines, as was addressed in the BACT determination for this project, is whether turbines are in a combined cycle configuration or in a simple cycle configuration and, for turbines in a simple cycle or peaking configuration, whether the turbines are smaller 'aero-derivative turbines' or larger 'frame turbines,' which were not developed for use as aircraft engines. The BACT determination for NO_x for the proposed project appropriately addresses frame turbines in a simple cycle configuration.

"The only simple cycle combustion turbines with BACT limits less than 9 ppm are aero-derivative turbines using SCR. As discussed in the permit application, aero-derivative turbines have much lower exhaust temperatures than frame turbines and are therefore more amenable to application of SCR. There are no aero-derivative turbines available at the 190 MW nominal size of combustion turbine that is proposed for this project. Nevertheless, as discussed in the Project Summary,

the application included an analysis of the use of the largest available aero-derivative combustion turbines (LMS100s) with SCR, and demonstrated that this was not a cost-effective alternative, i.e., the cost impacts would be excessive. In particular, the costs would be in excess of \$70,000 and \$200,000 per additional ton of NOx controlled at, respectively, the permitted level and expected level of annual operation of the turbines."

The U.S. EPA provided in follow-up comments a table of seven power projects permitted in recent years, and in one case still in permitting, at the Texas Commission on Environmental Quality that it said proved its case about BACT. They are: December 2015 air permit application (still pending), AES Gen Dev LLC, located in Harris County, 673 MW to 1,001 MW combined cycle; May 2012 permit issued, NRG Texas Power LLC, SR Bertron plant, Harris County, 823 MW combined cycle; December 2014 permit issued, Shawnee Energy Center, Hill County, 920 MW; January 2014 issued, El Paso Electric, El Paso County, 400 MW (four 100-MW gas turbines); June 2012 issued, Friendswood En. Genco LLC, Harris County, 128 MW; August 2007 issued, Laredo WLE LP, Webb County, 200 MW; and January 2011 issued, Exelon/EXTE X La Porte Ltd., Dallas County, 395 MW.

Illinois EPA responded that the table provides information for projects for which applications are pending and turbines that were never constructed and perhaps more significantly, provides information that is not consistent with information provided in the RACT/BACT/LAER Clearinghouse (RBLC).

It said three of the projects referenced in this table have not yet been constructed and as such, have not yet demonstrated that they can achieve the limits cited. This includes the AES Gen Dev, the NRG Texas Power/SR Bertron and the Friendswood En. Genco projects. In fact, the AES Gen project is only in the planning stages, the state added.

Two of the cited projects, El Paso Electric and Laredo WLE LP, are both aero-derivative turbine projects and the former is significantly smaller than the unit proposed by Invenegy. The aeroderivate turbine proposed for El Paso Electric is only 100 MW.

Finally, the information provided in the RBLC for both the Shawnee Energy Center and the Exelon/TXTEX LaPorte Ltd. project does not match the information cited in the table, the state agency said.

For instance, regarding the Shawnee Energy Center, the table indicates that the turbine will employ a dry low-NOx burner and SCR technology. However, the RBLC merely indicates that the turbine will utilize dry low-NOx control. In addition, the table indicates that this same turbine is subject to a NOx emission limit of 4 ppm when, in fact, the RBLC shows that the turbine is subject to a NOx emission limit of 9 ppm. A review of the specification sheet for Shawnee shows that the turbine is a frame unit, not an aero-derivative unit, and further confirms that this unit is capable of achieving a NOx emission rate of 9 ppm.

Concerning Exelon/EXTEX LaPorte, the table misrepresents both the turbine configuration and size. While the table indicates that the project is for a two-turbine, 194 MW capacity (each), Exelon's EXTEX LaPorte Generating Station website states that this project consists of a four-turbine, 152-MW capacity (each). Wrote the Illinois agency: "This is significant given this information indicates that these turbines are significantly smaller than the turbines proposed by Invenegy, two 190 MW combustion turbines. It should further be noted, for Exelon to achieve a NOx limit of 2.5 ppm, SCR technology is required. However, as previously discussed, the addition of SCR technology to the Invenegy turbines is not cost effective. In summary, after review of the seven projects provided in the follow-up comment, a BACT limit lower than 9 ppm is not justified."

ABOUT THE AUTHOR

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