ENSR
2 Technology Park Drive, Westford, Massachusetts 01886-3140
T 978.589.3000 F 978.589.3100 www.ensr.aecom.com

Duke Cliffside Units 6 & 7

Application Addendum – Cost Effectiveness of SCR Control for Auxiliary Boiler

Duke Energy submitted a PSD permit application to construct two new generating units with supporting equipment at its Cliffside Steam Station in Rutherford and Cleveland Counties, North Carolina on December 16, 2005. During its technical review of the proposed application, NCDAQ requested additional supporting information regarding the determination that add-on control technology is not cost effective for application to the proposed 190 MMBtu/hr auxiliary boiler. This supporting information is provided in this addendum.

The proposed auxiliary boiler is a 190 MMBtu/hr "package" boiler, fired exclusively with low sulfur (0.05% S) No.2 distillate oil. The auxiliary boiler will be used to provide steam for space heating, standby and startup needs when the proposed coal units are out of service; hence, Duke has proposed an enforceable operating restriction limiting operation of the auxiliary boiler to no more than 10% capacity factor, equivalent to full load operation for no more than 876 hours per year.

In preparing the permit application, ENSR noted that according to USEPA data, no auxiliary boilers used in similar applications have ever been permitted or operated with add-on NO_x control, an indication that such technology is not cost effective for application to an auxiliary boiler that is restricted to operation essentially as an emergency backup unit. NCDAQ has requested further documentation that the application of add-on control technology for emissions of NO_x would not be cost effective, as provided in this addendum.

Due to advances in technology, package boilers that burn low sulfur distillate are routinely supplied with burners of low NO_x design, with resulting NO_x emissions of around 0.1 lb NO_x/MMBtu. This proposed emission limit provides a maximum allowable NO_x emission rate from the proposed auxiliary boiler of 0.1 lb/MMBtu x 190 MMBtu/hr x 876 hrs/yr x 1 ton/2000lb = 8.3 tons NO_x/yr. Selective Catalytic Reduction (SCR) is believed to represent "transferable technology" for potential application to distillate oil-fired auxiliary boilers. While SCR is not well suited to operations of auxiliary units with frequent starts and stops (no NO_x control is experienced at all until the catalyst bed achieves full operating temperature, negating any NOx control during the first few hours after startup), for this analysis we conservatively assume that a hypothetical SCR could remove 90% of the proposed potential annual NO_x emissions, or 7.5 tpy.

ENSR obtained a budgetary cost estimate to apply SCR to a similarly sized package boiler from Nationwide Boiler. As shown on the attached cost effectiveness estimating Tables, the basic SCR equipment would have a capital cost of ~ $ 740,000. Using a factored cost estimating approach as outlined in USEPA's Control Cost Manual yields a total (installed) capital cost of $ 1,425,000. The annualized cost to operate SCR for 876 hours per year, including capital recovery based on 10% interest for a 10 year financing period, would exceed $374,000/yr. The cost effectiveness of application of SCR to the proposed auxiliary boiler, therefore, would exceed $50,000/ton of NO_x controlled, which is clearly not cost effective for this particular application.