UPDATE ON SCR OPERATION AT THE BIRCHWOOD POWER FACILITY

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The Southern Energy, Inc. Birchwood Power Facility is a 240 MW_e coal-fired plant located twelve miles east of Fredricksburg, Virginia. The unit is a cogenerator, supplying electricity to a local utility and process steam to a greenhouse facility located near the plant.

The steam generator is a tangential fired, Controlled Circulation® unit provided by Combustion Engineering, Inc. (ABB CE). The fuel is a low sulfur, bituminous coal from West Virginia. The plant uses state-of-the-art emission control technologies including: a TFS 2000™ firing system in combination with selective catalytic reduction (SCR) for NO_x control, a spray dryer absorber (SDA) using a lime slurry for SO_x control, and a reverse air baghouse for particulate collection. Since startup of the unit in November, 1996, average NO_x emissions have been maintained below 0.10 lb/10^6 Btu (73 ppmvd @ 3% O_2), average SO_x emissions below 0.10 lb/10^6 Btu (53 ppmvd @ 3% O_2) and outlet dust emissions below 0.02 lb/10^6 Btu.

Over 1 1/2 years of operation, the unit has run primarily in a dispatch cycling mode. More than two hundred startups have occurred since commercial

operation. Recent operation has included fewer startups and less dispatch service.

The main features of the TFS 2000™ firing system that contribute to high combustion efficiency and low NO_x generation are:

Pulverized Coal Fineness Control
Early Coal Devolatilization Control
Concentric Firing - Horizontal Offset Air Firing
Firing Zone Stoichiometry Control including:
    Furnace Bulk Air Staging
    Activated Zoned Stoichiometry Controls

The TFS 2000™ firing system has consistently maintained NO_x emissions below 0.20 lb/10^6 Btu (146 ppmvd @ 3% O_2) over a load range from 125 MW_e to 240 MW_e. These low NO_x emissions are being achieved even during the dispatch cycling occurring at the plant.

In order to achieve NO_x emissions below 0.10 lb/10^6 Btu, a high dust SCR reactor was installed upstream of a single air heater. The actual NO_x removal efficiencies across the SCR have ranged from 50 % at top load to 65 % at low loads. After 5000 hours of operation, there is no indication of ammonia in the ash nor evidence of ammonia-based air heater deposits. Catalyst plate surfaces are clean with very little ash deposits on the metal surfaces along the perimeter of the modules.

Ammonia is injected upstream of the reactor chamber within a temperature range of 580°F to 752°F (304.4°C to 400°C). An economizer bypass system is designed to maintain adequate temperatures to the SCR down to approximately 32 % load (72 MW_e). This feature is essential for preventing

ammonium bisulfate formation on catalyst surfaces and minimizing ammonia slip exiting the process. Additional economizer surface installed downstream of the SCR chamber increases boiler efficiency whenever the economizer bypass is activated. Improvements in boiler efficiency ranging from 0.50 % to over 1.00 % are realized as compared to conventional arrangements with single backpass economizers.

Below 400°F (204.4°C), flue gas is diverted around the total catalyst surface through a reactor bypass duct. The main advantage of this arrangement is to protect the catalyst from unburned hydrocarbons, ash deposits, and lower than optimum flue gas temperatures during startup and low load operation. Since Birchwood experiences frequent startups and shutdowns, this feature is essential in extending the life of the catalyst.

The emissions leaving the SCR are maintained significantly below 0.10 $lb/10^6$ Btu (73 ppmvd @ 3% O_2) on a 30-day rolling average. This emission level allows flexibility in unit operation during the frequent transient conditions experienced at the plant.

The success of the integrated NO_x reduction system at Birchwood is a result of the conservative design of the furnace, pulverizers, firing system and SCR. It is anticipated that these reliable technologies will be called upon to meet even lower regulatory NO_x emissions in the future.