ENVIRONMENTAL ANALYSIS SUPPORT

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INTRODUCTION

Activities in environmental analysis support included assistance to the U.S. Department of Energy's (DOE's) National Energy Technology Laboratory (NETL) at Morgantown and Pittsburgh in reviewing and preparing documents required by the National Environmental Policy Act (NEPA) for proposed clean coal demonstration projects. An important activity was the preparation of an Environmental Assessment (EA) for a project selected by DOE under the Power Plant Improvement Initiative (PPII) to demonstrate the integration of technologies to reduce emissions of sulfur dioxide (SO_2), oxides of nitrogen (NO_x), sulfur trioxide (SO_3), mercury (Hg), hydrogen chloride (HCl), and hydrogen fluoride (HF) from smaller (<300 MW) coal-fired boilers.

DISCUSSION OF CURRENT ACTIVITIES

The EA was prepared to evaluate the potential environmental impacts associated with constructing and operating an integrated multi-pollutant control system proposed by CONSOL Energy Inc. and AES Greenidge LLC. The EA will be used by DOE in making a decision on whether or not to provide cost-shared funding to design, construct, and demonstrate the proposed system at the existing Unit 4 of Applied Energy Services' (AES's) Greenidge Station in Dresden, New York. DOE's share of the funding for the 4.5-year demonstration project is expected to be about $14.5 million, while about $18.3 million would be provided by CONSOL and its project partners. The commercial-scale demonstration would allow utilities to make decisions regarding the integrated emissions control system as a viable commercial option.

The site for the proposed project at Greenidge Station is located immediately southeast of Dresden, New York, along the western shore of Seneca Lake. The site is in a rural area within Yates County. The nearest large town is Geneva, located about 15 miles to the north at the northern tip of Seneca Lake. Greenidge Station, which occupies a 153-acre site, currently consists of the 54-MW Unit 3 and the 107-MW Unit 4, which generate a total of approximately 161 MW (net) of electricity for the power grid. Units 3 and 4 burn eastern bituminous pulverized coal.

The proposed project would integrate a single-bed selective catalytic reduction (SCR) system for NO_x control and a circulating dry scrubber (CDS) for SO_2, Hg, HCl, HF, and SO_3 control. By reducing SO_3 emissions, the CDS would also minimize visible emissions from the stack. This pollution control system is particularly suited for retrofitting smaller (<300 MW) coal-fired boilers that could be vulnerable to retirement or fuel switching under current environmental regulations.

The NO_x control system consists of commercially available low-NO_x burners, a single-bed SCR system in the flue gas duct, an ammonia (NH_3) storage and vaporization system, and an ammonia injection system. The CDS system consists of a hydrator and hydrated lime feed system, the CDS vessel, an electrostatic precipitator (ESP) or baghouse for particulate control, and a carbon injection system for Hg control. The CDS is expected to reduce fine particulate emissions because it agglomerates fine particulate matter into coarser material that would be collected in an ESP or baghouse.

The in-duct SCR system is a passive technology with a minimal amount of moving parts, in which NO_x reduction occurs via a chemical reaction with ammonia in the presence of a catalyst. Ammonia supply to the flue gas stream relies on an ammonia pump, control valves, and a dilution air

blower. Ammonia flow is controlled by two NO_x analyzers in the flue gas. Because the technology is passive, negligible impact on station reliability is anticipated.

The CDS system uses an absorption tower that contains no moving parts. Because water containing a minimal amount of dissolved or suspended solids is sprayed into the system, feedline plugging, nozzle plugging, erosion, abrasion, and solids build-up are avoided. Because the injected water evaporates completely in the absorption tower, the process operates as a dry system. A mixture of hydrated lime and dry fly ash collected in the ESP or baghouse is injected into the absorption tower via an airslide. Gravity provides the force for injection because the bottom of the particulate control device is located higher above the ground than the injection point on the absorption tower. The initial feed rate of hydrated lime is determined by measuring the SO_2 concentration in the inlet flue gas. The feed rate is adjusted by monitoring the SO_2 concentration at the exit of the particulate control device. The gas temperature leaving the absorber controls the amount of flue gas cooling water injected through high-pressure flow nozzles into the absorber. Solids are discharged from the system at the same rate that hydrated lime, fly ash, and SO_2 enter the system.

The operating reliability of the CDS process is expected to be greater than flue gas desulfurization (FGD) processes currently in use because of its simplicity, minimal number of process components, and ease of control. In addition, because of a smaller number of components to be installed and the ability to construct the CDS system without affecting existing power plant operation, the time required to connect the system would be relatively short, which would minimize unit downtime. Another advantage of the CDS technology compared to traditional FGD systems is that it consumes less electricity. The CDS system would only require about 0.5% of unit power generation compared to an FGD process requirement for 0.7-1.5% of the generated power.

The goals of the proposed demonstration include both improved cost-competitiveness with current technologies (particularly for SO_2, NO_x, and Hg control on smaller coal-fired units) and greatly reduced Hg, SO_3, and fine particulate emissions compared to conventional technologies. The following emissions targets have been established for the integrated technologies compared with uncontrolled emissions: a 95% reduction in emissions of SO_2, SO_3, HCl, and HF, a 60% to 90% reduction in Hg emissions, NO_x emissions of less than 0.122 lb/MMBtu, and no visible emissions from the stack.

Because Greenidge Unit 4 currently uses waste wood as feedstock to provide up to 10% of the heat input to the furnace (and is permitted to combust up to 30% waste wood by total weight), the proposed project would determine the effect of biomass firing on the performance of the integrated pollution control technologies. In addition, the project would quantify the magnitude of carbon dioxide (CO_2) emissions reductions and fuel cost reductions associated with using waste wood as feedstock.

Work on the EA included the evaluation of potential impacts to environmental resources that could result from construction and operation of the proposed project. Key findings from the evaluation are discussed below. Potential air quality impacts resulting from changes at Greenidge Station during demonstration of the proposed project would generally be beneficial because, with the exception of ammonia, plantwide air emissions would decrease or continue at the same level. The maximum ammonia concentration was predicted by air dispersion modeling to be 0.02 $\mu g/m^3$ for a 1-hour averaging period. By comparison, the National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) for ammonia is 25 ppm (17,400 $\mu g/m^3$). RELs are time-weighted average (TWA) concentrations for up to a 10-hour work day during a 40-hour work week. The maximum predicted concentration is a negligible fraction of the REL.

The proposed project would not affect the quality or quantity of the liquid effluent from Greenidge Station, but somewhat more water would be withdrawn from Seneca Lake. The proposed

project would require an additional 93 gpm of service water that would be consumed by operation of the lime hydrator and CDS rather than being returned to the lake. This additional water is slightly less than 20% of the plant's current consumptive use, and represents only about 0.1% of Greenidge Station's total water use. Thus, adverse impacts on water quality and quantity in Seneca Lake would be negligible.

No additional wastewater would be generated from the proposed project. Accidental spills, if any, of ammonia from the storage tank for the SCR system would be prevented from reaching surface water by secondary containment. Due to a reduction in air emissions of SO_2, NO_x, HCl, and HF (which are associated with acid deposition) and Hg (which adversely affects humans and biota), the proposed project would have a slight beneficial effect on area surface waters.

The proposed project would increase the quantity of fly ash generated by Greenidge Station by about 50%. This increase would result almost entirely from (1) the use of lime in the CDS system and (2) the enhanced capture of fine particles (including calcium sulfate and calcium sulfite formed from SO_2 reacting with the calcium in lime). The enhanced capture would occur because the CDS agglomerates fine particles into coarser material that would be collected in a new ESP or baghouse. Minor increases in volume would result from the activated carbon used in the CDS system. The proposed project would not affect Greenidge Station's generation of bottom ash or the subsequent use of this material.

Fly ash generated in project operation would have somewhat different characteristics than the fly ash currently generated by Greenidge Station. The facility's current fly ash is a mixture consisting primarily of mineral ash and a small amount of unburned carbon that is captured with the fly ash. Fly ash from the proposed project would include these same constituents, with the addition of lime and other calcium compounds formed from the lime, powdered activated carbon, and increased amounts of sulfate compounds and other materials removed from air emissions. Project participants would characterize this material physically and chemically, and would investigate possible opportunities for beneficial reuse, which would reduce the need for landfill disposal. Leaching tests would be done, in part to evaluate the stability of trace constituents of coal (such as Hg) incorporated in the ash and to verify that the material would not be a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA).

The proposed project would not affect any uses or users of groundwater. No uses of groundwater occur in the site vicinity, and the project also would not use groundwater as a water source for project construction or operation. Temporary dewatering of excavations during construction activities might collect some groundwater in addition to stormwater runoff, but because permeability is low the amounts would be small and any changes in the water table would be very localized.

The project would not affect offsite land use because it would be confined to an existing industrial area within the Greenidge Station and the nearby AES-owned Lockwood Landfill. Disposal of waste generated by the proposed project would be unlikely to affect groundwater quality because the landfill is lined and equipped with a leachate collection system. If leachate were to reach groundwater (e.g., due to a leak in a landfill liner), periodic sampling of groundwater monitoring wells downgradient from the landfill should detect it. Contaminant migration would be slow, so any needed remedial measures could be implemented in time to prevent contaminants from migrating to surface water or sites where water is used. Past waste disposal has affected the quality of groundwater collected in underdrains beneath older portions of the Lockwood Landfill that are not lined, but this water does not remain in the ground, and contaminant migration has not been detected in downgradient monitoring wells. Eventual landfill closure would extend hydrological controls to older portions of the landfill, thus reducing the potential for old waste disposal to affect groundwater over the long term.

The estimated 150 additional vehicle trips that would result from construction workers driving to and from the project site each day would represent about a 6% increase over existing traffic on nearby Highway 14. By itself, this small increase would not be expected to create an appreciable impact on the highway's overall level of service. However, because the additional trips would occur at approximately the same time each morning and evening, slight impacts to traffic flow and safety on Highway 14 could occur during peak drive times, which could be exacerbated if they would coincide with summer tourist traffic on Highway 14 and with delivery trucks using Highway 14 to access Greenidge Station. Traffic flow would be monitored during the construction period to determine if actions (e.g., scheduling the arrival and departure times of workers in 15-minute shifts) would be appropriate to avoid traffic congestion. Traffic flow and safety on Highway 14 could also be affected by additional commercial truck trips to and from the project site during construction. Currently, about 20 trucks access Greenidge Station per week. During the peak construction period, especially during concrete foundation pouring, up to 15 additional trucks would enter the project site per day. Traffic flow would be monitored during the construction period to determine if actions (e.g., scheduling truck deliveries to avoid construction workers' arrival and departure times) would be appropriate to avoid traffic congestion.