DOE/EA-1493

ENVIRONMENTAL ASSESSMENT

GREENIDGE MULTI-POLLUTANT CONTROL PROJECT

AES GREENIDGE STATION
DRESDEN, NEW YORK

August 2004

U.S. DEPARTMENT OF ENERGY

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ACRONYMS AND ABBREVIATIONS

ADT	average daily traffic
AES	Applied Energy Services
Btu	British thermal unit
CAA	Clean Air Act
$CaCO_3$	calcium carbonate
CDS	circulating dry scrubber
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
cfs	cubic feet per second
cm	centimeter
CO	carbon monoxide
CO_2	carbon dioxide
COE	U.S. Army Corps of Engineers
CWA	Clean Water Act
dB	decibels
dB(A)	decibels as measured on the A-weighted scale
DOE	U.S. Department of Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
EMF	electromagnetic fields
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ESP	electrostatic precipitator
EF	degrees Fahrenheit
FGD	flue gas desulfurization
FONSI	Finding of No Significant Impact
FR	*Federal Register*
ft	feet
ft^3	cubic feet
FWS	U.S. Fish and Wildlife Service
g	the acceleration of gravity
gpd	gallons per day
gpm	gallons per minute
H_2O	water
HCl	hydrogen chloride
HF	hydrogen fluoride
Hg	mercury
in.	inch
lb	pound
Φg	microgram
Φm	micrometer
m^3	cubic meter
mg	milligram
mg/L	milligrams per liter

MGD	million gallons per day
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NH_3	ammonia
NHPA	National Historic Preservation Act of 1966
NIOSH	National Institute for Occupational Safety and Health
NO_2	nitrogen dioxide
NO_X	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NYSDEC	New York State Department of Environmental Conservation
O_3	ozone
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
Pb	lead
pH	hydrogen-ion concentration notation
PM-10	particulate matter less than 10 Φm in aerodynamic diameter
PM-2.5	particulate matter less than 2.5 Φm in aerodynamic diameter
PPE	personal protective equipment
PPII	Power Plant Improvement Initiative
ppm	parts per million
PSD	Prevention of Significant Deterioration
Pub. L.	Public Law
RCRA	Resource Conservation and Recovery Act
REL	Recommended Exposure Limit
SCR	selective catalytic reduction
SCREEN3	a screening air dispersion model
sec	second
SGLP	Synthetic Groundwater Leaching Procedure
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SO_3	sulfur trioxide
SPCCP	spill prevention, control, and countermeasures plan
SPDES	State Pollutant Discharge Elimination System
SPL	Sound Pressure Level
TCLP	toxic characteristic leaching procedure
TWA	time weighted average
USC	*United States Code*
USGS	U. S. Geological Survey
V_2O_5	vanadium pentoxide
VOCs	volatile organic compounds
yd^3	cubic yard

1. PURPOSE AND NEED FOR AGENCY ACTION

1.1 INTRODUCTION

This environmental assessment (EA) has been prepared by the U.S. Department of Energy (DOE), in compliance with the National Environmental Policy Act of 1969 (NEPA) as amended (42 USC 4321 et seq.), 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 107-MW 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 project has been 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.

The U.S. Congress established the PPII in Pub. L. 106-291, Department of the Interior and Related Agencies Appropriations Act for Fiscal Year 2001. Congress directed DOE to provide up to $95 million in cost-shared funding to demonstrate commercial-scale technologies that improve the reliability and environmental performance of existing and new coal-fired power plants in the United States. Congress expected the selected technologies to provide options by which coal plants could continue to generate low-cost electricity with improved performance and in compliance with stringent environmental standards.

The PPII Solicitation, issued in February 2001, required participants (i.e., the non-federal-government participant or participants) to offer projects having potential for demonstrating substantial improvements in power plant performance, leading to enhanced electric reliability. These improvements included increased efficiency of electricity production, reduced environmental impacts, and/or increased cost-competitiveness. The projects were also required to be applicable to a large portion of existing plants and and of commercial scale in order to enhance opportunities for timely deployment.

In response to the solicitation, DOE received 24 proposals in April 2001 and selected 8 of the projects in September 2001 based on the following evaluation criteria: technical merits of the proposed technology (40%), commercial viability and market potential of the proposed technology (30%), and management approach and capabilities of the project team (30%). Along with the technical merits, DOE considered the participant's funding and financial proposal; DOE budget constraints; environmental, health and safety implications; and program policy factors. Following selection, two of the projects were withdrawn by their participants in March 2002 and in October 2002.

Each project participant is required to finance at least 50% of the total cost of the project. After completion of a successful project demonstration, the participant would be obligated to repay the government's financial contribution to ensure that taxpayers benefit from a successful project. The project participant takes primary responsibility for designing, constructing, and demonstrating the project. During project execution, the government oversees project activities, provides technical advice, assesses progress by periodically reviewing project performance with the participant, and participates in decision making at major project junctures. In this manner, the government ensures that schedules are maintained, costs are controlled, project objectives are met, and the government's funds are repaid.

DOE expects to provide approximately $51 million for the 6 remaining projects. Private sector sponsors are expected to contribute nearly $61 million, exceeding the 50% private sector cost-sharing mandated by Congress. The host sites for the projects cover a large geographical cross-section of the United States, including Florida, Virginia, New York, Ohio, South Dakota, and Kansas. The duration of the demonstration projects ranges from slightly over a year to five years.

1.2 PROPOSED ACTION

The proposed action is for DOE to provide cost-shared funding support for the design, construction, and demonstration of an integrated multi-pollutant control system at the existing 107-MW Unit 4 of AES's coal-fired 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.

CONSOL Energy Inc. and AES Greenidge LLC conceived and proposed the technologies in response to the DOE solicitation. Because DOE's role would be limited to providing the cost-shared funding for the proposed project, DOE's will decide whether or not to fund the project. DOE's limited involvement constrains the range of alternatives considered in the EA (Section 2.2), and DOE will make its decision based on those alternatives.

1.3 PURPOSE

The purpose of the proposed project is to generate technical, environmental, and financial data from the design, construction, and operation of the proposed combination of technologies to allow industry to assess the project's potential for commercial application. The proposed combination of technologies is designed to reduce the capital and operating costs of environmental controls for SO_2, NO_x, SO_3, HCl, HF, Hg, and visible emissions. A demonstration indicating that the performance and cost targets are achievable at the 100-MW scale would convince potential customers in the smaller boiler market that the integration of these systems is not only feasible but economically attractive.

1.4 NEED

The need for the proposed project is to address the Congressional mandate in Public Law 106-291 to demonstrate technologies at the commercial scale that improve the reliability and environmental performance of existing and new coal-fired power plants in the United States. DOE's cost-shared funding would help reduce the financial risk to the project participant in demonstrating the proposed combination of technologies:

the single-bed selective catalytic reduction (SCR) system and the circulating dry scrubber (CDS).

The smaller boiler market is the target for the proposed combination of technologies. Currently, there are about 500 units in the United States less than 300 MW in size with a combined generating capacity of about 69,000 MW, which represents about 25% of the installed coal-based generating capacity and almost 50% of the installed boilers. The 500 units are the target market for this combination of technologies because, based on information developed from potential purchaser interviews, the smaller boilers are likely to either switch fuel or be retired in the future. If only the 190 boilers less than 110 MW are retired, the generating capacity would be reduced by up to 16,000 MW, which would exacerbate electricity and natural gas supply and distribution problems throughout the United States. Therefore, a strong incentive exists to commercialize technologies designed specifically to meet the environmental compliance needs of the smaller generating units. Because the SCR system is a low-cost option for controlling NO_x emissions from smaller generators and allows greater fuel flexibility, such as co-firing coal and biomass, it provides a feasible alternative to retiring units as NO_x allocations are reduced and the NO_x credit market tightens.

1.5 NATIONAL ENVIRONMENTAL POLICY ACT STRATEGY

This EA has been prepared in compliance with NEPA for use by DOE decision-makers in determining whether or not to provide cost-shared funding for the design, construction, and demonstration of the proposed project under the PPII solicitation. DOE’s policy is to comply fully with the letter and spirit of NEPA, which ensures that early consideration is given to environmental values and factors in federal planning and decision making. No action taken by DOE with regard to any proposal, including project selection or award, is considered a final decision prior to completion of the NEPA process.

For this proposed project, DOE has determined that an EA should be prepared to assess the significance of potential impacts resulting from the proposed action and reasonable alternatives. The purpose of the EA is to provide a sufficient basis for determining whether DOE should then prepare an Environmental Impact Statement (EIS) or should issue a Finding of No Significant Impact (FONSI). Based on the findings of this EA, if DOE determines that providing cost-shared funding would constitute a major federal action because the proposed project may significantly affect the quality of the human environment, then an EIS will be prepared to assess the potential impacts in more detail. However, if DOE determines that providing cost-shared funding would not constitute a major federal action because the proposed project would not significantly affect the quality of the human environment, then DOE will issue a FONSI.

The Oak Ridge National Laboratory (ORNL) has assisted DOE in preparing this EA and supporting documents for the proposed project. In independently assessing the issues and preparing the EA, ORNL has utilized information provided by DOE; other federal, state, and local agencies; the project participant team; and others. DOE is responsible for the scope and content of the EA and supporting documents and has provided direction to ORNL, as appropriate, in the preparation of these documents.

The issues that have been identified and evaluated in the EA include land use, aesthetics, atmospheric resources, water resources, geological resources, floodplains, wetlands, ecological resources, waste management, cultural resources, socioeconomic resources, transportation, noise, electromagnetic fields, and human health and safety. Related evaluations include impacts of commercial operation, cumulative effects, regulatory compliance and permit requirements, irreversible or irretrievable commitments of resources, and the relationship between short-term uses of the environment and long-term productivity. The scope of the assessment includes upgrades and alterations to Greenidge Station that are not considered part of the proposed project (i.e., replacing the secondary superheater section, installing low-NO_x burners, and potentially replacing the economizer and primary superheater sections) because they are inseparably linked with the proposed project (i.e., the integrated multi-pollutant control system would require much of the combined equipment, which would be installed concurrently).

2. THE PROPOSED ACTION AND ALTERNATIVES

This section discusses the proposed action, the no-action alternative (including four scenarios that would reasonably be expected to result as a consequence of the no-action alternative), and alternatives dismissed from further consideration.

2.1 PROPOSED ACTION

The proposed action is for DOE to provide support through cost-shared funding for the design, construction, and demonstration of an integrated multi-pollutant control system at the existing Unit 4 of AES's coal-fired Greenidge Station in Dresden, New York (Section 1.2). The proposed action described in the following sections is DOE's preferred alternative.

2.1.1 Project Location and Background

The site for the proposed project is located at Greenidge Station, which is immediately southeast of Dresden, New York, along the western shore of Seneca Lake (Figure 2.1.1). The site is in a rural area of Torrey Township within Yates County. The nearest large town is Geneva, located about 15 miles to the north at the northern tip of Seneca Lake. Penn Yan, the county seat of Yates County, is located about 5 miles to the west of Greenidge Station.

Figure 2.1.1. Regional location map for the proposed project.

Greenidge Station, which occupies a 153-acre site (Figure 2.1.2), 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. An additional 8 to 9 MW are produced to satisfy internal electrical needs at the station (the difference between gross MW and net MW). Figure 2.1.3 is a photograph of Greenidge Station, as viewed toward the northwest. The plant site is bounded on the east by Seneca Lake; on the north by the Keuka Lake Outlet; on the west by Route 14; and on the south by Ferro Corporation. A mix of agricultural, industrial, commercial, and residential land use exists in the vicinity. The main entrance to the plant is easily accessed from Route 14. In addition, AES hauls fly ash for disposal at its 143-acre Lockwood Landfill, which is located on the opposite side of Route 14 to the west-southwest of Greenidge Station (Figure 2.1.2). The equipment for the proposed project would occupy about 3 acres of land, which currently serves as a paved laydown area and contractor parking lot adjacent to the existing powerhouse for Units 3 and 4 (Figure 2.1.4). The 3-acre site was previously excavated and graded in preparation for construction of a new unit, but those plans have since been abandoned.

Units 1 and 2 of Greenidge Station were constructed for the New York State Electric & Gas Corporation in 1937 and 1939, respectively. The power plant expanded in 1950 with the construction of Unit 3 to provide additional electricity needed in the area. Construction of Unit 4, the host unit for the proposed project, began in December 1951, and the unit was placed in service in December 1953. Units 1 and 2 were retired in the 1980s at the end of their useful lifetime. The boilers and turbines were removed from the powerhouse but their two idle chimneys remain adjacent to the powerhouse. Consequently, Units 3 and 4 occupy part of the powerhouse, while the remaining area formerly housing Units 1 and 2 is empty. This unoccupied space is insufficient to house the equipment for the proposed project; in particular, the circulating dry scrubber (CDS) would be taller than the inside height of the powerhouse. Boilers 1 and 2 served the Unit 1 steam turbine, Boiler 3 served the Unit 2 steam turbine, Boilers 4 and 5 serve the Unit 3 steam turbine, and Boiler 6 serves the Unit 4 steam turbine. AES bought Greenidge Station from the New York State Electric & Gas Corporation in May 1999. The plant employs 44 people.

Units 3 and 4 burn eastern bituminous pulverized coal. Conveyors with a capacity of 300 tons per hour transport crushed coal to the powerhouse for storage in the bunkers prior to combustion in the 3 remaining boilers (Boilers 4, 5, and 6). All outside conveyors are enclosed on three sides for dust control. Unit 4 also 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). Units 3 and 4 use once-through cooling for non-contact condensing of the steam exhausted from the steam turbine generators. Water for cooling is drawn from Seneca Lake, and the heated water is returned to the lake via a discharge channel and Keuka Outlet. Trains and trucks deliver materials to the plant (Section 2.1.6.3).

For emissions control, neither Unit 3 nor Unit 4 is equipped with a scrubber, but Unit 3 uses two electrostatic precipitators (ESPs) for particulate control (one for each boiler), and another ESP serves Unit 4. To control NO_x emissions, Unit 3 uses overfire air (air injected above the main combustion zone in a boiler for more complete combustion). In 1994, a gas reburn system was installed on Unit 4 to provide natural gas and overfire

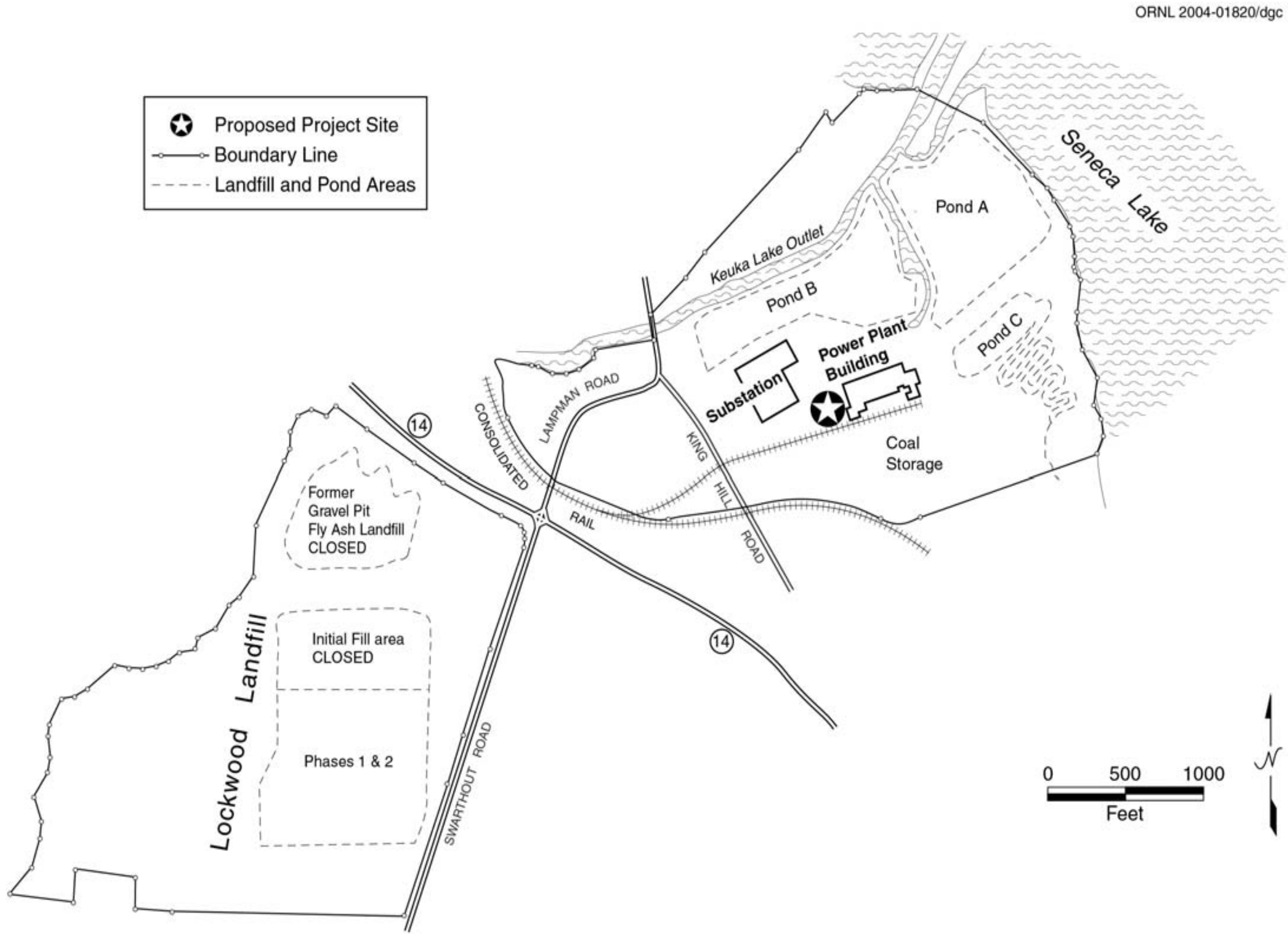

Figure 2.1.2. Site of Greenidge Station and Lockwood Landfill.

Figure 2.1.3. Photograph of Greenidge Station, as viewed toward the northwest.

Figure 2.1.4. Photograph of the site for the proposed project at Greenidge Station, as viewed toward the northwest.

air for NO_x control.[1] When the complete system was operating, combustion of natural gas in Unit 4 provided about 15% of the total heat input to the boiler. Currently, overfire air is used without natural gas because the price of natural gas is very high.

2.1.2 Technology Description

The proposed project would integrate a single-bed selective catalytic reduction (SCR) system for NO_x control and a 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 multi-pollutant control system is depicted in Figure 2.1.5. The NO_x control system consists of commercially available low-NO_x burners (not considered part of the proposed project because the technology is mature in the market), 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 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 mostly 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.

[1] In a gas reburn system, coal and combustion air to the main burners are reduced and natural gas is injected to create a fuel-rich secondary combustion zone above the main burner zone, with final combustion air injected to create a fuel-lean burnout zone. The formation of NO_x is inhibited in the main burner zone due to the reduced combustion intensity, and NO_x is destroyed in the fuel-rich secondary combustion zone by conversion to molecular nitrogen.

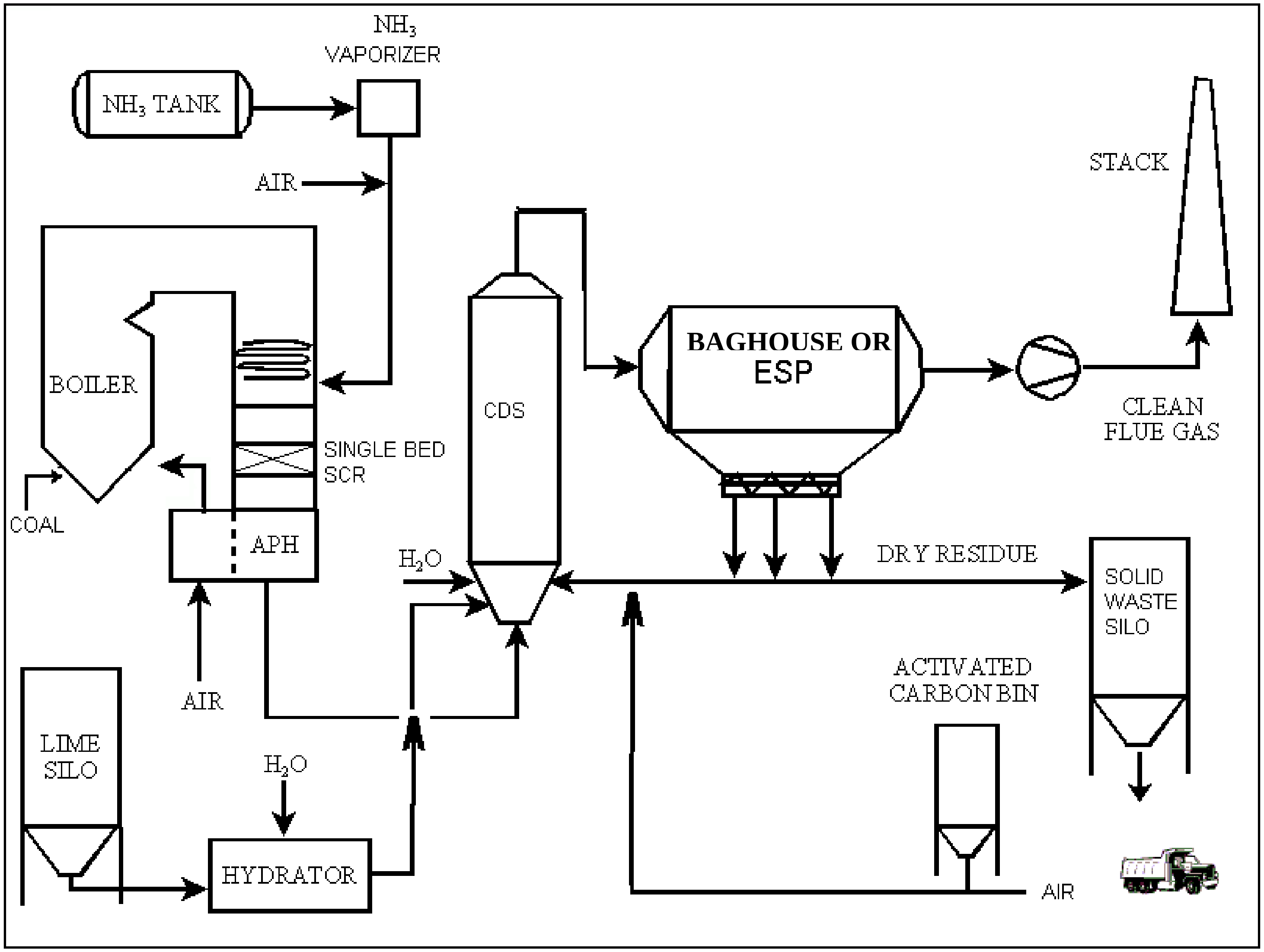

Figure 2.1.5. A generalized diagram of the proposed multi-pollutant control system.

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.

2.1.3 Project Description

The proposed project would integrate the technologies described in Section 2.1.2 into the existing 107-MW Greenidge Unit 4. Because of the additional particulate loading resulting from the injection of lime and powdered activated carbon, a new ESP or new baghouse would replace the existing ESP at Unit 4. The successful bidder providing the equipment would decide whether to install an ESP or a baghouse; however, the equipment selection is inconsequential for this analysis in this EA because the specifications for particulate control would be identical in either case. Bottom ash would continue to be sold to municipalities to provide road traction during winter driving conditions. Disposal of fly ash would continue at AES’s nearby Lockwood Landfill, while commercial application of the material would be pursued (e.g., cinder blocks, stabilization agent).

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 cabon dioxide ($CO_{2)}$ emissions reductions and fuel cost reductions associated with using waste wood as feedstock.

2.1.4 Construction Plans

Construction activities associated with the proposed project would include foundation laying, steel fabrication, piping installation, and electrical wiring installation. Construction would begin about April 2005 and continue until April 2006, at which time a major outage would be conducted to tie in the equipment for the proposed project to the existing Unit 4, as well as tying in some other modifications. Upgrades and alterations to Greenidge Station, which are not part of the proposed project but which are required by the integrated multi-pollutant control system or are important features in the overall renovation, include replacing the secondary superheater section, installing low-NO_x

burners, and potentially replacing the economizer and primary superheater sections. The duration of the Unit 4 outage would be about 2 months. If construction progress were insufficient to begin the outage in April 2006, the flexibility would exist to perform the outage in the fall of 2006. The timing of the Unit 4 outage would correspond with periodic maintenance outages scheduled for the spring and fall to avoid the peak load periods during the summer and winter. Startup and checkout of the integrated multi-pollutant control system would begin in June 2006 and be completed in September 2006.

About 20 to 30 construction workers would be involved with excavation and laying foundations during the initial construction at the site. Approximately 100 to 150 workers would be required during the peak construction period of tying in the equipment. Due to carpooling, about 75 construction workers' vehicles would be parked daily at the station during this peak period.

Locally obtained construction materials would include crushed stone, sand, and lumber for the proposed facilities and temporary structures such as enclosures, forms, and scaffolding. Components of the facilities would include structural steel, concrete, piping, ductwork, insulation, and electrical cable.

During construction, major components and fabricated equipment would be delivered to the site by truck. About 15 trucks would be expected to deliver materials daily for the proposed project during peak construction periods (i.e., during concrete foundation pouring). Approximately one truck per week would haul away construction debris to a municipal landfill (Section 2.1.7.3).

Land requirements during construction and operation are discussed in Section 2.1.6.1.

2.1.5 Operational Plans

Demonstration of the proposed project would be conducted within the 4.5-year period of the cooperative agreement covering September 2004 through February 2009. The actual performance testing and monitoring would occur during the 12-month period from September 2006 until September 2007. The level of staffing at Greenidge Station would remain at 44 employees during the demonstration. As with current practice, 4 plant workers would be on duty during each of four rotating 12-hour shifts, in addition to maintenance workers, managers, and administrative staff working regular hours.

If the demonstration is successful, commercial operation would follow immediately without change from the demonstration period (Section 5). The details of injection rates and control levels for the proposed project would be determined during the demonstration. Long-term staffing would not be expected to change from existing levels. The integrated multi-pollutant control system would be designed for a lifetime of 20 years.

Unit 4 would be expected to operate at generally the same power level and percentage of time as under current conditions, maintaining a combustion efficiency of about 32% and a capacity factor of about 80%. Operation of the proposed project would require about 1 MW of electricity generated by Greenidge Station. Because Units 3 and 4 are usually at their peak capacity when they're operating, the loss of 1 MW to the electrical grid would likely be offset by other power plants within the grid. However, because the amount is very small compared with regional electrical capacity, the offset would barely be perceptible and is not evaluated further.

2.1.6 Resource Requirements

Table 2.1.1 displays the operating characteristics, including resource requirements, for the existing Greenidge Station compared with the plant after implementation of the proposed project.

2.1.6.1 Land Area Requirements

A portion of the 3-acre, previously disturbed site for the proposed project would be used temporarily during construction activities for equipment/material laydown, storage, assembly of site-fabricated components, staging of material, and facilities to be used by the construction workforce (i.e., offices and sanitary facilities). Other smaller vacant, cleared areas around the site would also be used as staging and/or fabrication areas.

The permanent structures, including surrounding access space, for the proposed project would occupy a total of about 3 acres of land. Limited site clearing and grading would be required because the land currently serves as a paved laydown area and contractor parking lot adjacent to the existing powerhouse for Units 3 and 4. A new paved parking lot would likely be built on vacant, cleared land near the powerhouse to compensate for the loss of the existing lot.

2.1.6.2 Water Requirements

Water would be used during construction of the proposed project for various purposes, including personal consumption and sanitation, concrete formulation and preparation of other mixtures needed to construct the facilities, equipment washdown, general cleaning, dust suppression, and fire protection. Potable water used during construction would be supplied by the Penn Yan municipal water system, which provides water to Dresden, while service water would be drawn from the underground conduit that supplies Unit 3 cooling water and plantwide service water (i.e., water used for auxiliary equipment cooling, equipment washing, and demineralization). Combined potable and service water use during construction would average about 1 gallon per minute (gpm). Drinking water also would be provided using bottled water. Portable toilets would minimize requirements for additional sanitary water.

During demonstration of the proposed project, Greenidge Station cooling water and service water would continue to be provided by Seneca Lake, while potable water would continue to be supplied by the Penn Yan municipal water system. For part of its water needs, Greenidge Station is equipped with an 8-ft diameter gravity-fed intake pipe that extends underwater approximately 700 ft beyond the shoreline to a lake-bottom intake structure. Beneath the shoreline, the pipe feeds into an underground concrete tunnel that conveys the water to the powerhouse. At the powerhouse, most of the water is pumped for use as noncontact cooling water to condense the steam exhausted from the Unit 3 steam turbine, while the remaining water is pumped for use as service water by the entire plant. The cooling water is returned to the lake after passing through the Unit 3 condenser, while the service water undergoes treatment prior to discharge to the C pond (Figure 2.1.2). Unit 4 is equipped with a separate intake structure, intake pipeline, pump house, and discharge pipeline used exclusively for its cooling water. A 7-ft diameter intake pipe extends approximately 650 ft beyond the Seneca Lake shoreline above the lake surface, terminating in a submerged intake structure about 25 ft below the lake

Table 2.1.1. Typical operating characteristics for Greenidge Station Unit 4 alone and combined with Unit 3

	Unit 4		**Units 3 and 4**	
Operating characteristics	2002 base year	Including the proposed project	2002 base year	Including the proposed project
Generating capacity (net), MW	107	106	161	160
Capacity factor, %[a]	80	No change	80	No change
Size of power plant site, acres	153	No change	153	No change
Size of project site, acres		3		3
Size of nearby Lockwood Landfill, acres	143	No change	143	No change
Bituminous coal consumption, tons/year	290,000	No change	450,000	No change
Wood consumption, tons/year	11,450	No change	11,450	No change
No. 2 fuel oil consumption, gallons/year	49,000	No change	120,000	No change
Lime, tons/year	0	18,940	0	18,940
Ammonia, tons/year	0	128	0	128
Activated carbon, tons/year	0	43	0	43
Air emissions, tons/year				
Sulfur dioxide (SO_2)	13,369	602	19,450	6,683
Oxides of nitrogen (NO_x)	1,820	660	3,190	2,030
Particulate matter (PM-10)	63	63	95	95
Particulate matter (PM-2.5)	28	28	42	42
Carbon monoxide (CO)	74	74	92	92
Volatile organic compounds (VOCs)	15	15	18	18
Hydrogen chloride (HCl)	276	14	409	147
Hydrogen fluoride (HF)	33	2	50	19
Mercury (Hg)	0.012	0.005	0.018	0.011
Ammonia (NH_3)	0	0.14	0	0.14
Carbon dioxide (CO_2)	900,000	900,000 [b]	1,300,000	1,300,000[b]

Table 2.1.1. concluded.

Operating characteristics	Unit 4		Units 3 and 4	
	2002 base year	Including the proposed project	2002 base year	Including the proposed project
Water use, gpm				
Noncontact cooling water	68,000	No change	93,000	No change
Service water	0	93	500	593
Potable water	1.2	No change	112	No change
Effluents, gpm				
Noncontact cooling water	68,000	No change	93,000	No change
Treated wastewater to Seneca Lake	0.7	No change	1	No change
Solid waste, tons/year				
Bottom ash	5,800	No change	8,700	No change
Fly ash	40,000	70,000	59,000	89,000

[a] Capacity factor is the ratio of the energy output during a period of time to the energy that would have been produced if the equipment had operated at its maximum power during that period.

[b] CO_2 emissions would probably not change substantially from the current level because the circulating dry scrubber (CDS) would be expected to decrease CO_2 emissions but the decrease would probably be offset by the reduced boiler thermal efficiency resulting from the new low-NO_x burners (not considered part of the proposed project).

surface. The cooling water is returned to Seneca Lake from the units' separate discharge pipelines via a common discharge channel north of the powerhouse that flows northward into Keuka Outlet, which was formerly part of the canal system. Keuka Outlet, in turn, flows eastward into Seneca Lake. The actual increase in cooling water temperature resulting from the heat transfer to condense the steam exhausted from the turbines is about 18-20°F. Figure 2.1.6 is a water flow diagram that depicts current water requirements and discharges at Greenidge Station.

During the demonstration, the total flow of once-through, noncontact cooling water required to operate both units of the power plant at full load would continue to average 93,000 gpm. Potable water needs for the power plant would continue to be about 1.2 gpm. The plant's requirements for service water would increase from the current level of about 500 gpm to a level of 593 gpm because of the additional water needed for the lime hydrator and for the CDS. The lime hydrator would use about 7 gpm and the CDS would use approximately 86 gpm. The water would be drawn from Seneca Lake using the underground conduit that supplies Unit 3 cooling water and plantwide service water. The water would be consumed during the proposed processes rather than being returned to the lake. This additional water would represent approximately 0.1% of Greenidge Station's current water use supplied by the lake and about 15% of the plant's consumptive use.

2.1.6.3 Fuel and Sorbent Requirements

The current fuel requirements of Greenidge Station would continue at approximately the same level during the demonstration of the proposed project. The plant annually burns about 450,000 tons of eastern bituminous coal. Currently, approximately 90-93% of the coal is shipped by rail to the plant from mines near Wana, West Virginia, in Monongalia County near the southwestern corner of Pennsylvania, about 275 miles to the southwest of Greenidge Station. A train of 50 rail cars delivers coal to the station approximately twice weekly. Coal is dumped from the bottom of the rail cars into hoppers below the tracks. Occasionally, a train of 100 cars transports coal to the Dresden area, with 50 rail cars being delivered to Greenidge Station and the remaining 50 cars being held at a railroad siding immediately north of Dresden. The rail cars at the siding are switched with the rail cars at the power plant after the initial 50 cars have been unloaded.

The remaining 7-10% of the coal, about 30,000 to 35,000 tons annually, is currently delivered by truck from the Fisher Mining Company's Thomas mine near English Center, Pennsylvania, about 100 miles to the south of Greenidge Station. About 1,300 loads are delivered annually (i.e., about 25 loads per week) in 25-ton trucks, which dump the coal directly on a coal storage pile. The two coals are segregated within the storage pile and blended at the power plant to reduce the overall sulfur content of the higher-sulfur coal delivered by train using the lower-sulfur coal delivered by truck. While Fisher Mining Company currently is the only supplier of coal by truck, other small mines in the region could also supply lower-sulfur coal. Table 2.1.2 presents an analysis of the composition of the two types of coal.

During demonstration of the proposed project, the lower-sulfur coal would probably not be required for Unit 4 because the CDS would reduce SO_2 emissions from

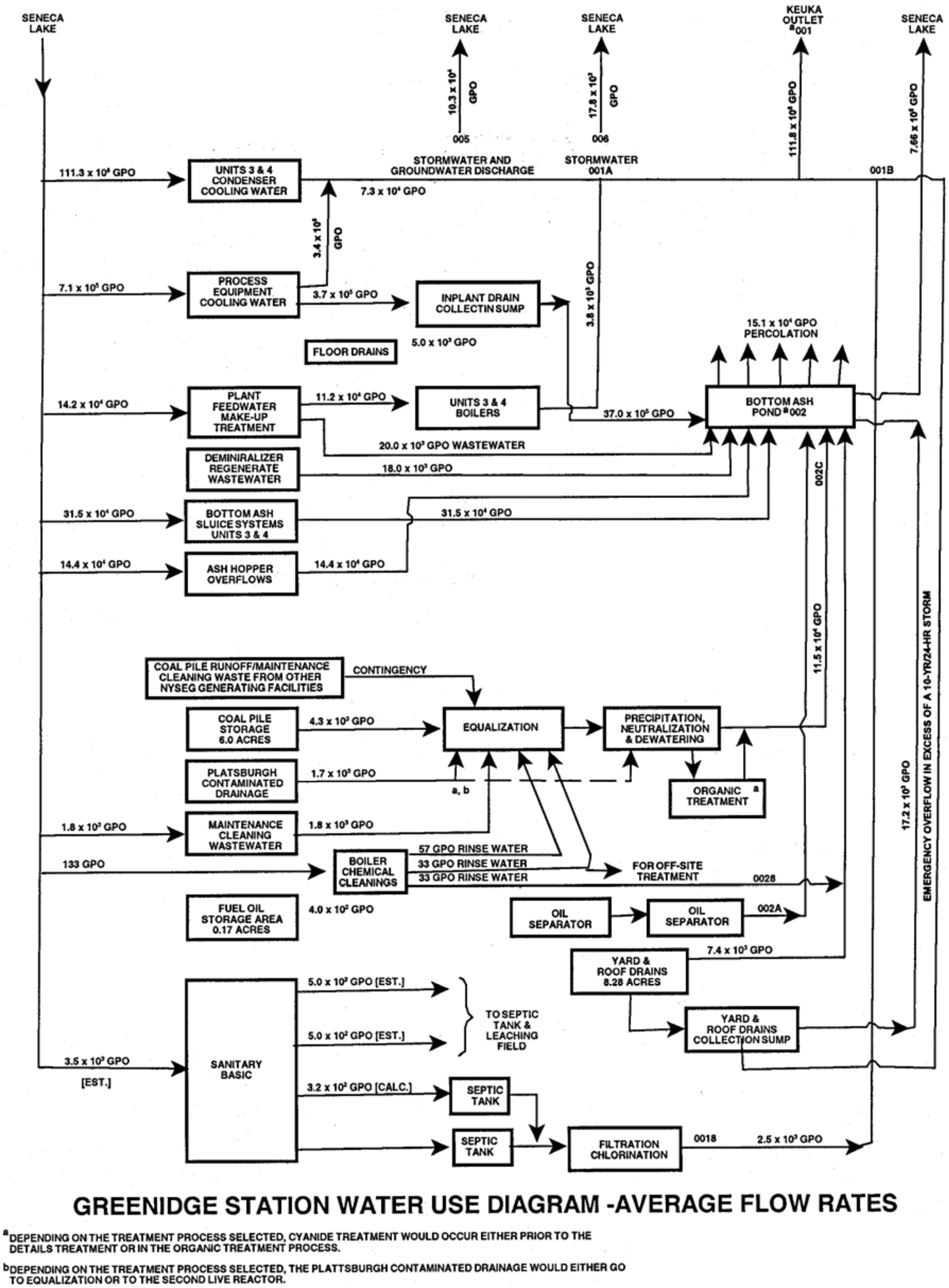

Figure 2.1.6. Water flow diagram that depicts water requirements and discharges at Greenidge Station.

Table 2.1.2. Composition of bituminous coal consumed at Greenidge Station

Characteristic	Monongalia coal typical value	Fisher coal typical value
Higher heating value, Btu/lb	13,097	11,800
Analysis, % by weight		
Moisture	5.80	7.63
Carbon	72.17	67.86
Hydrogen	4.79	3.86
Nitrogen	1.36	1.55
Sulfur	2.90	0.91
Ash	7.85	13.47
Oxygen	5.04	4.72
Chlorine	0.10	0.07

unblended, higher-sulfur coal by approximately 95%. Consequently, Unit 4 would require about the same amount of coal, but about 2 additional trains of 100 rail cars each would deliver coal annually to offset about 850 loads no longer delivered by truck. Unit 3 would continue to require about 450 truck loads per year of lower-sulfur coal to blend with higher-sulfur coal at the power plant to reduce the overall sulfur content.

Unit 4 also uses waste wood as feedstock in the combustor. The waste wood currently provides up to 10% of the total heat input to the boiler, which amounts to about 11,450 tons of wood annually. The waste wood is in the form of particle board that is transported by truck from a furniture manufacturer in Jamestown, New York, about 150 miles to the west-southwest of Greenidge Station. One truck per day usually delivers the waste wood. The arrangement is mutually beneficial because the furniture manufacturer avoids the cost of landfill disposal of the waste wood, while Unit 4 uses the wood as fuel.

About 120,000 gallons (gal) of No. 2 fuel oil are consumed annually at the plant for ignition and warm-up of the units. The fuel is delivered to the plant site by tanker trucks.

During demonstration of the proposed project, annual consumption of lime for the CDS and ammonia for the SCR system would be about 18,940 tons and 128 tons, respectively. The lime would probably be delivered by truck from Bellefonte, Pennsylvania, about 170 miles to the south-southwest of Greenidge Station. About 1,000 loads would be delivered annually in 20-ton trucks. The lime could possibly be shipped by rail rather than truck. Ammonia would probably be delivered by truck from Allentown, Pennsylvania, about 200 miles to the south-southeast of the power plant. About 6 loads would be delivered annually in 20-ton tanker trucks. Annual consumption of powdered activated carbon for Hg control would be approximately 43 tons. About 3 loads would be delivered annually in 20-ton trucks. A supplier of the carbon has not yet been identified.

2.1.7 Outputs, Discharges, and Wastes

Table 2.1.1 includes a summary of discharges and wastes for the existing Greenidge Station compared with the plant after implementation of the proposed project.

2.1.7.1 Air Emissions

Air emissions from Greenidge Station would generally decrease or continue at the same level during the demonstration of the proposed project. SO_2 emissions would decrease from 19,450 tons per year currently to 6,683 tons per year. NO_x emissions would decrease from 3,190 tons per year currently to 2,030 tons per year. Because of the additional particulate loading resulting from the injection of lime and powdered activated carbon, a new, more efficient ESP or new baghouse would replace the existing ESP at Unit 4. Consequently, plantwide PM-10 and PM-2.5 emissions would probably decrease compared with current annual emissions of 95 and 42 tons, respectively. However, it is assumed in this analysis that particulate emissions would continue at the same level because the additional particulate loading would at least partially offset (1) the improved efficiency of the ESP or baghouse and (2) the probably discontinuation of Unit 4's use of higher-ash coal from the Fisher Mining Company (Table 2.1.2). CO and volatile organic compound (VOC) emissions would also be expected to remain at the same level (i.e., 92 and 18 tons per year, respectively). Plantwide Hg emissions would decrease from about 36 lb per year currently to about 22 lb per year because of the powdered activated carbon injected into the recycle stream or into the CDS. Due to ammonia (NH_3) injection into the flue gas, NH_3 emissions would increase from near zero to about 280 lb per year. Plantwide HCl and HF emissions would decrease to about 147 and 19 tons per year, respectively, compared with current emissions of 409 and 50 tons per year, respectively.

SO_3 emissions are expected to decrease by the same percentage as SO_2 emissions, but current and future emissions are not known. Trace emissions of other pollutants would include beryllium, sulfuric acid mist, benzene, arsenic, and various heavy metals. CO_2 emissions would probably not change substantially from the current level of 1,300,000 tons per year because the CDS would be expected to decrease CO_2 emissions but the decrease would probably be offset by an increase due to a change in combustion characteristics associated with the new low-NOx burners (not part of the proposed project). Although CO_2 is not considered an air pollutant, CO_2 emissions contribute to the greenhouse effect that is suspected to cause global warming and climate change (Mitchell 1989).

As discussed in Section 2.1.6.3, Unit 4 has the capability of co-firing coal with waste wood in the form of particle board, which is bonded with urea-formaldehyde. The wood contains less than 0.1% (by weight) formaldehyde, which is suspected of carcinogenic potential in humans. Emissions of organic compounds, including formaldehyde, are typically very low in power plant boilers because nearly complete combustion is attained by the high combustion temperatures and relatively long fuel-residence times. A formaldehyde emission analysis was performed by stack sampling at another New York power plant that co-fires coal with waste wood containing urea-formaldehyde (Lindsey 2004). As part of the analysis, the study included blanks to measure the ambient levels of formaldehyde in reagent solutions prior to the introduction of material collected from stack sampling. A statistical review of the data collected during the study concluded that formaldehyde levels during co-firing operation were indistinguishable from the laboratory blank levels. Also, formaldehyde emissions from

100% coal-fired operation were indistinguishable from emissions during co-firing operation, both of which were nearly undetectable (Lindsey 2004). During the demonstration of the proposed project, formaldehyde emissions would be expected to remain very low.

2.1.7.2 Liquid Discharges

The proposed project would not affect liquid effluent at Greenidge Station. The discharge of once-through, noncontact cooling water with both units operating at full load would continue to average 93,000 gpm. The cooling water from the units is discharged from separate pipelines to Seneca Lake via a common discharge channel and Keuka Outlet (Section 2.1.6.2). About 1 gpm of backwash effluent from the reverse osmosis system would continue to be discharged to C Pond (a settling pond) and ultimately to Seneca Lake. Floor drains and other collection sumps collect water potentially co-mingled with oil. Oil is captured by oil-adsorbent cloth on the surface of the sumps and the water is discharged to C Pond. The oil-adsorbent cloth is replaced periodically and transported from the site by a licensed waste management contractor to authorized facilities for disposal.

Stormwater runoff from the lined coal pile storage area is collected in the surge basin, conveyed periodically to the wastewater plant for treatment, and discharged to C Pond. Stormwater runoff from the lined Lockwood Landfill is captured using an underground leachate collection system that conveys the water to an adjacent sedimentation pond where it is sampled and treated, if necessary.

2.1.7.3 Solid Wastes

Non-hazardous solid wastes generated at Greenidge Station include used office materials, empty material containers, and coal combustion ash. Non-hazardous solid wastes, with the exception of coal combustion ash, are removed from the site at regular intervals by a waste management contractor and transported for disposal at the Ontario County municipal landfill in Flint, New York, about 15 miles to the north-northwest of Greenidge Station, or at the Seneca Meadows municipal landfill in Seneca Falls, New York, about 20 miles to the northeast of the station. As part of the proposed project, the existing Unit 4 ESP may be dismantled and the metal plating sold for scrap. The remaining material from the ESP would go to a municipal landfill.

The power plant currently generates about 8,700 tons per year of bottom ash and 59,000 tons per year of fly ash (the latter amount includes water used to wet the ash for transport). During the demonstration of the proposed project, the amount of bottom ash produced would not change, while the quantity of fly ash collected would increase to a yearly maximum of 89,000 tons due to the addition of Unit 4’s new, more efficient ESP or new baghouse, which would capture additional fly ash resulting from the injection of lime and powdered activated carbon.

Currently, all bottom ash is sold to municipalities to apply on roads for vehicle traction during treacherous winter conditions. Until sold, the bottom ash is stored in a settling pond and excavated as needed. Although some fly ash was sold until about 1995, all fly ash is currently trucked to the nearby AES-owned, double-lined Lockwood Landfill (Figure 2.1.2) for disposal. On average, 6 truck loads are transported daily from the fly ash silo to the landfill. Capacity at the landfill is sufficient for a remaining lifetime of more than 20 years. During the demonstration, bottom ash would continue to be sold to municipalities, and fly ash would be trucked to Lockwood Landfill. In addition, a commercial application for the fly ash would be pursued (e.g., cinder blocks, stabilization agent). If successfully implemented in the marketplace, the commercial application would reduce the amount of fly ash requiring disposal at the landfill to less than 89,000 tons per year.

Fly ash transported to the landfill is conditioned with water to control dust and allow compaction. Ash is transported to the landfill site in covered trucks. Most of the short haul road is on AES property. The working face at the landfill is oriented in a direction to minimize fugitive dust.

2.1.7.4 Toxic and Hazardous Materials

During operation, Greenidge Station requires potentially toxic or hazardous materials, such as chlorine and solvents, and generates potentially toxic or hazardous materials, including waste paints, oils, used rags, and empty material containers. All chemicals are properly labeled and stored according to local fire codes and Occupational Safety and Health Administration (OSHA) requirements. Chlorine is used for water filtration, while the solvents are used primarily in maintenance activities. Hazardous wastes generated during operation are removed from the site at regular intervals by a licensed waste management contractor and transported to authorized facilities for disposal. All toxic and hazardous materials are transported by truck to and from the station.

The power plant has in place a program to reduce, reuse, and recycle materials to the extent practicable. All light bulbs are treated as hazardous waste and disposed of in properly licensed facilities. The plant has a Spill Prevention, Control, and Countermeasures Plan (SPCCP) (40 CFR Part 112) that addresses the accidental release of materials to the environment.

With the exception of ammonia used in the SCR process, the proposed project would not affect the power plant's requirements for or generation of toxic and hazardous materials. Proper precautions would be taken during ammonia storage and handling to minimize the risk of an accidental release of ammonia. The ammonia would be stored in a cylindrical tank with secondary containment of sufficient volume to hold the entire contents of the tank in the unlikely event of a rupture. A SPCCP would be developed for ammonia, and the ammonia storage would comply with Emergency Planning and Community Right-to-Know Act (EPCRA) notification requirements. The ammonia would be transported by truck to the station (Section 2.1.6.3).

2.2 ALTERNATIVES

The goals of a federal action establish the limits of its reasonable alternatives under the NEPA process. Congress established the PPII with a specific goal— to demonstrate commercial-scale technologies that improve the reliability and environmental performance of existing and new coal-fired power plants in the United States. DOE’s purpose in considering the proposed action (to provide cost-shared funding) is to demonstrate the viability of the integrated multi-pollutant control system in achieving the goal for the program. Reasonable alternatives to this proposed action must be capable of meeting this purpose.

Congress also directed DOE to pursue the goals of the legislation by providing partial funding for projects owned and controlled by nonfederal-government participants. This statutory requirement places DOE in a much more limited role than if the federal government were the owner and operator of the project. In the latter situation, DOE would ordinarily be required to review a wide variety of reasonable alternatives to the proposed action. However, in dealing with a nonfederal applicant, the scope of alternatives is necessarily more restricted. It is appropriate in such cases for DOE to give substantial weight to the needs of the proposer in establishing reasonable alternatives to the proposed action. Moreover, under the PPII, DOE's role is limited to approving or disapproving the project as proposed by the participant.

Thus, the only reasonable alternative to the proposed action is the no-action alternative, including four scenarios reasonably expected as a consequence of the no-action alternative (Section 2.2.1).

2.2.1 No-Action Alternative

Under the no-action alternative, DOE would not provide cost-shared funding to demonstrate the integrated multi-pollutant control system. Without DOE participation, the proposed project would be canceled, and the proposed combination of technologies would probably not be demonstrated elsewhere. Consequently, commercialization of the integrated multi-pollutant control system could be delayed or might not occur because utilities and industries tend to use known and demonstrated technologies over new, unproven technologies. At the site of the proposed project, four reasonably foreseeable scenarios could result. None of these scenarios would contribute to the PPII goal of demonstrating technologies at the commercial scale that improve the reliability and environmental performance of existing and new coal-fired power plants in the United States.

First, AES could shut down Greenidge Station. Because the plant is expected to be subject to more stringent emissions standards, mothballing or dismantling the plant would be one option available to the owners rather than installing expensive, commercially available emissions control equipment to comply with upcoming standards. Under this scenario, no construction activities would be undertaken, and no employment would be provided for construction workers in the area except for some limited activity associated with mothballing or dismantling the plant. Existing operations would cease, no electricity would be generated at the Greenidge site, and power plant workers would lose their jobs. Resource requirements and discharges and wastes would also cease. Current environmental conditions at the site would tend to revert back to conditions prior to plant operation, and existing impacts would be reduced.

However, to meet the existing regional demand for electricity, more electricity would need to be generated at one or more other sites to offset the elimination of electrical generation at Greenidge Station. While the exact location or locations are uncertain, the sites are likely to be at existing under-utilized power plants that have excess available capacity because they are costly and inefficient to operate. This rationale is based on the premise that, to meet demand, electric utilities typically dispatch electricity according to operating cost, starting with the least costly. The under-utilized plants would also tend to be older and generate greater quantities of air emissions, liquid discharges, and solid wastes. Therefore, while current environmental impacts would be reduced at the Greenidge site, impacts would likely increase at the site(s) where electrical generation would increase to compensate for shutting down Greenidge Station.

Second, AES could install commercially available pollution controls to comply with future emissions standards. Under this scenario, operations would remain essentially the same as for the existing plant. Electricity would be generated at approximately the same rate. Resource requirements and discharges and wastes would generally be the same, except that air emissions would be reduced because of the enhanced pollution controls and solid wastes would likely increase due to the captured air emissions. Additional solid wastes would likely be recycled or sold as a usable product. Because this scenario and the proposed project involve the installation of new pollution controls on an existing unit, construction activities associated with this scenario would be similar in scale to those of the proposed project. With the exception of improving air quality, there would be minimal change in current environmental conditions at the site and the impacts would remain very similar to existing conditions.

Third, AES could switch to using natural gas rather than coal at Greenidge Station, while maintaining most of the current equipment such as the boilers, turbines, ductwork, and chimneys. The need for some of the existing infrastructure such as the coal handling facilities and ash silos would be reduced or eliminated, depending on whether Unit 4 alone or both units were switched. Because a new 14-mile natural gas pipeline would need to be constructed to deliver the fuel, construction activities would probably be at a slightly greater level than those associated with the proposed project. Because of pipeline construction, disturbance beyond the Greenidge site would be greater under this scenario. Electricity would be generated at approximately the same rate. Resource requirements and discharges and wastes would generally be smaller because of the type of fuel and because the converted facility would be more efficient than the existing plant due to a new gas-fired delivery system and other upgrades. Air emissions, particularly SO_2 emissions, would be considerably less because a new gas-fired delivery system would burn more efficiently and cleanly than an aging coal-fired power plant with limited emissions controls. Ash generation would be reduced or eliminated at the power plant, depending on whether Unit 4 alone or both units were switched. Current environmental conditions and impacts at the site would be expected to improve.

Finally, AES could purchase emissions allowances (e.g., SO_2, NO_x) as a compliance strategy for future emissions standards. By purchasing emissions allowances, AES would be compensating another utility or utilities for overcomplying with the standards while allowing the region as a whole to meet the limits for those emissions. Under this scenario, the existing power plant would continue to operate without change. No construction activities would be undertaken, and existing operations would remain essentially the same. Electricity would be generated at the same rate. Resource requirements and discharges and wastes would be the same. There would be negligible change in current environmental conditions at the site and the impacts would remain very similar to existing impacts. This scenario would not provide employment for construction workers in the area.

2.2.2 Alternatives Dismissed from Further Consideration

The following sections discuss alternatives that were initially identified and considered by the project participant. Because DOE’s role is limited to providing the cost-shared funding for the selected project, DOE is limited to either accepting or rejecting the project as proposed by the participant, including the proposed technology and site. As such, reasonable alternatives to the proposed project are narrowed and the following alternatives have been dismissed from further consideration.

2.2.2.1 Alternative Sites

CONSOL Energy initially considered additional sites during their site selection process. Site selection was governed primarily by benefits that could be realized by the companies participating in the project. An existing plant site was preferred because the cost associated with construction of the project and a new power plant at an undeveloped site would be much higher and the environmental impacts likely would be much greater than at an existing facility. The site selected for the project had to provide the maximum benefit to the companies by closely meeting the project's technical needs and integrating with existing infrastructure. No other sites were considered after AES's Greenidge Station in Dresden, New York, was identified as a candidate to host the project. Based on the above considerations, other sites are not reasonable alternatives and are not evaluated in this EA.

2.2.2.2 Alternative Technologies

Other technologies have been dismissed as not reasonable. The proposed project was selected to demonstrate the operation of an integrated multi-pollutant control system on a coal-fired power plant. Other PPII projects were selected to demonstrate other coal-based technologies. The preselection reviews included environmental comparisons of proposals. The projects selected for demonstration are not considered alternatives to each other.

The use of other technologies and approaches which are not applicable to coal (e.g., natural gas, wind power, solar energy, and conservation) would not contribute to the PPII goal of demonstrating technologies at the commercial scale that improve the reliability and environmental performance of existing and new coal-fired power plants in the United States.

2.2.2.3 Other Alternatives

Other alternatives, such as delaying or reducing the size of the proposed project, have been dismissed as not reasonable. Delaying the project would not result in any change of environmental impacts once the project were implemented but would adversely delay reductions in air emissions from the existing power plant and adversely affect the PPII goal of demonstrating technologies at the commercial scale for potential customers in the smaller boiler market. The design size for the proposed combination of technologies was selected because it is considered to be typical of the smaller boiler market; the size is large enough to show utilities that the technology, once demonstrated at this scale, could be applied without further scale-up to many units of similar size. A demonstration indicating that the performance and cost targets are achievable at the 100-MW scale would convince potential customers that the integration of these systems is not only feasible but economically attractive (Section 1.3).

3. EXISTING ENVIRONMENT

3.1 SITE DESCRIPTION, LAND USE, AND AESTHETICS

The proposed project would be located at Greenidge Station in Yates County, New York, along the western shore of Seneca Lake (Figure 2.1.1). The equipment and surrounding access space for the proposed project would occupy a total of about 3 acres of land, which currently serves as a paved laydown area and contractor parking lot adjacent to the existing powerhouse for Units 3 and 4.

Yates County is primarily rural, with over 73% of its population classified as "rural" and 27% as "urban" in the 2000 U.S. Census (U.S. Census Bureau 2004a). Agriculture, particularly that associated with vineyards and wine-making, is becoming an increasingly important land use in the county. While the amount of land in farms and the number of full-time farms decreased by 3% and 8%, respectively, in the state of New York between 1992 and 1997, they increased by 3% and 8%, respectively, in Yates County during the same period (USDA 1997).

The proposed project site is located within an existing industrial area (Greenidge Station) that is surrounded primarily by agricultural and rural residential land uses. The Greenidge Station property is bounded to the east by Seneca Lake. The area south of the Greenidge Station property is used for a variety of purposes, including manufacturing at the Ferro Electronic Materials plant (which employs about 200 workers), but is primarily agricultural with rural residences interspersed with vineyards and wineries. The areas west and north of the Greenidge Station property are also primarily agricultural, but with more residences (including the village of Dresden) and small commercial developments along State Highway 14.

The visual landscape of the Greenidge Station property is conspicuously marked with industrial facilities such as the powerhouse, ESP equipment, smokestacks, coal storage piles, ash storage silos, railroad facilities, and other associated infrastructure (Figure 2.1.3). The power plant is visible from the surrounding local area, including from nearby Seneca Lake.

3.2 ATMOSPHERIC RESOURCES

3.2.1 Climate

The regional climate, which is classified as humid continental, is influenced by the passage of multiple types of air masses. Cold, dry air frequently arrives from the northern interior of the continent, while winds from the south and southwest transport warm, humid air from the Gulf of Mexico and adjacent subtropical waters. These two air masses provide the dominant characteristics of the area’s climate. A third type of air mass occasionally flows inland from the Atlantic Ocean to produce cool, cloudy, and damp weather conditions.

Winters are generally long and cold, with an average of 137 days per year with temperatures below 32°F and an average of 5 days per year with temperatures below 0°F (as measured at Penn Yan, the nearest monitoring station, which is located about 7 miles to the west of Greenidge Station). In January, the daily maximum temperature is 33°F, on average, while the daily minimum is 17°F. Average annual snowfall is about 54 in. Summers are pleasantly warm, with an average of 11 days per year with temperatures above 90°F. In July, the daily maximum temperature is 83°F, on average, while the daily minimum is 61°F. Annual precipitation (excluding snow) averages about 31 in. The distribution of precipitation is fairly uniform during the year, ranging from around 2 in. during the winter months to around 3 in. during the summer months. As depicted in Figure 3.2.1, prevailing winds at Penn Yan are dominantly from the southwest quadrant with few winds from the easterly and northeasterly directions.

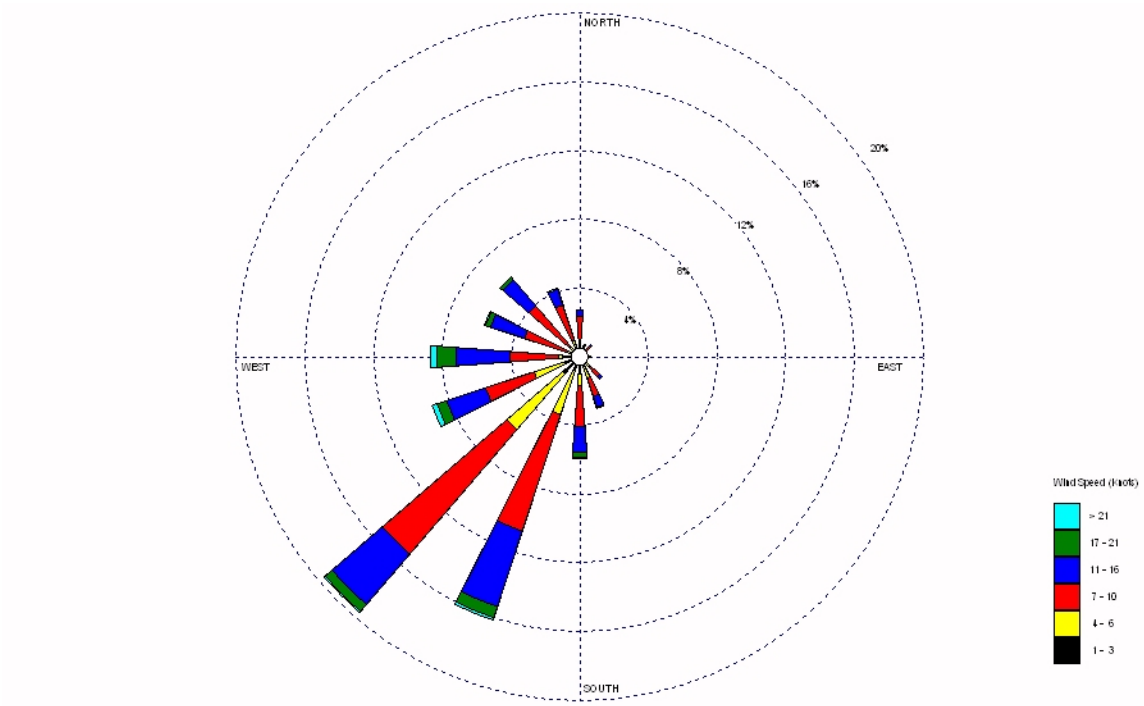

Figure 3.2.1. Wind rose for Penn Yan, New York (1999-2003). The frequency of wind blowing from each direction is plotted as a bar that extends from the center of the diagram. Wind speeds are denoted by bar widths and shading; the frequency of wind speed within each wind direction is depicted according to the length of that section of the bar. Because the wind rose displays directions **from** which the wind blows, emissions would travel downwind in the opposite direction.

3.2.2 Air Quality

Criteria pollutants are defined as those for which National Ambient Air Quality Standards (NAAQS) exist (Table 3.2.1). These pollutants are sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), carbon monoxide (CO), lead (Pb), and particulate matter less than or equal to 10 µm in aerodynamic diameter, designated PM-10. The U.S. Environmental Protection Agency (EPA) has also promulgated NAAQS for particulate matter less than or equal to 2.5 µm in aerodynamic diameter (PM-2.5) (62 FR 38652), and a new 8-hour NAAQS for O_3 to replace the 1-hour O_3 standard (62 FR 38856).

The NAAQS are expressed as concentrations of pollutants in the ambient air; that is, in the outdoor air to which the general public has access [40 CFR Part 501(e)]. Primary NAAQS define levels of air quality that EPA deems necessary, with an adequate

Table 3.2.1 National Ambient Air Quality Standards (NAAQS) for criteria pollutants

	Primary (Health related)		Secondary (Welfare related)	
Pollutant	Averaging period	Concentration	Averaging period	Concentration
CO	8-hour[a]	9 ppm (10 mg/m^3)	No secondary standard	
	1-hour[a]	35 ppm (40 mg/m^3)	No secondary standard	
Pb	Maximum quarterly average	1.5 µg/m^3	Same as primary standard	
NO_2	Annual arithmetic mean	0.053 ppm (100 µg/m^3)	Same as primary standard	
O_3	Maximum daily 1-hour average[b]	0.12 ppm (235 µg/m^3)	Same as primary standard	
	4th highest 8-hour daily maximum[c]	0.08 ppm (157 µg/m^3)	Same as primary standard	
PM-10	Annual arithmetic mean[d]	50 µg/m^3	Same as primary standard	
	24-hour[d]	150 µg/m^3	Same as primary standard	
PM-2.5	Annual arithmetic mean[e]	15 µg/m^3	Same as primary standard	
	98th percentile 24-hour[e]	65 µg/m^3	Same as primary standard	
SO_2	Annual arithmetic mean	80 µg/m^3 (0.03 ppm)	3-hour[a]	1300 µg/m^3 (0.50 ppm)
	24-hour[a]	365 µg/m^3 (0.14 ppm)		

[a]Not to be exceeded more than once per year.

[b]The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is equal to or less than 1, as determined according to Appendix H of the Ozone NAAQS.

[c]The 8-hour standard is met when the 3-year average of the annual 4th highest daily maximum 8-hour O_3 concentration is less than or equal to 0.08 ppm.

[d]The annual PM-10 standard is attained when the expected annual arithmetic mean concentration is less than or equal to 50 µ/m^3 (3-year average); the 24-hour standard is attained when the expected number of days above 150 µg/m^3 is less than or equal to 1 per year.

[e]The annual PM-2.5 standard is met when the annual average of the quarterly mean PM-2.5 concentrations is less than or equal to 15 µg/m^3, when averaged over 3 years. If spatial averaging is used, the annual averages from all monitors within the area may be averaged in the calculation of the 3-year mean. The 24-hour standard is met when the 98th percentile value, averaged over 3 years, is less than or equal to 65 µg/m^3.

margin of safety, to protect human health. Secondary NAAQS are similarly designated to protect human welfare by safeguarding environmental resources (such as soils, water, plants, and animals) and manufactured materials. States may modify NAAQS to make them more stringent, or set standards for additional pollutants. New York has added additional standards for criteria pollutants [e.g., 99% of 3-hour and 24-hour SO_2 concentrations shall not exceed 0.25 ppm (650 $\mu g/m^3$) and 0.10 ppm (261 $\mu g/m^3$), respectively.] New York has also set ambient air quality standards for non-methane hydrocarbons, fluorides, beryllium, and hydrogen sulfide. The New York standards are not quantified further or used in the analysis (Section 4.1.2.2) because Greenidge Station's air emissions during demonstration of the proposed project would decrease or continue at the same level, with the exception of ammonia (NH_3) (Section 2.1.7.1).

Yates County, as well as adjoining Seneca County, is in attainment with NAAQS and state ambient air quality standards for all pollutants (John Kent, New York State Department of Environmental Conservation, personal communication to Robert Miller, ORNL, March 11, 2004). Because the air quality falls within standards, no ambient air quality monitoring stations are located in these counties. SO_2 monitoring stations are located in Rochester, about 50 miles northwest of Dresden, and in Elmira, about 45 miles south-southeast of Dresden. PM-2.5 monitoring stations are also located in Rochester. A PM-10 monitoring station is located in Niagara Falls, about 120 miles west-northwest of Dresden, and an NO_2 monitoring station is located in Buffalo, about 100 miles west-northwest of Dresden. O_3 monitoring stations are located in Rochester, Elmira, and Williamson, about 45 miles north-northwest of Dresden.

In addition to ambient air quality standards, which represent an upper bound on allowable pollutant concentrations, national air quality standards exist for Prevention of Significant Deterioration (PSD) (40 CFR Part 51.166). The PSD standards differ from the NAAQS in that the NAAQS specify maximum allowable concentrations of pollutants, while PSD requirements provide maximum allowable increases in concentrations of pollutants for areas already in compliance with the NAAQS. PSD standards are therefore expressed as allowable increments in the atmospheric concentrations of specific pollutants. Allowable PSD increments currently exist for three pollutants (NO_2, SO_2, and PM-10). One set of allowable increments exists for Class II areas, which cover most of the United States, and a much more stringent set of allowable increments exists for Class I areas, which include many national parks and monuments, wilderness areas, and other areas as specified in 40 CFR Part 51.166(e). Allowable PSD increments for Class I and Class II areas are given in Table 3.2.2. The PSD Class I area nearest to Greenidge Station is Lye Brook Wilderness Area in Vermont, about 200 miles to the east-northeast.

Contaminants other than the criteria pollutants are present in the atmosphere in varying amounts that depend on the magnitude and characteristics of the sources, the distance from each source, and the residence time of each pollutant in the atmosphere. In the ambient air, many of these pollutants are present only in extremely small concentrations, requiring expensive state-of-the-art equipment for detection and measurement. Measurements of existing ambient air concentrations for many hazardous pollutants are, at best, sporadic. Regulation of these pollutants is attempted at the sources; emissions from specific source categories are regulated by the National Emissions Standards for Hazardous Air Pollutants (40 CFR Part 61; 40 CFR Part 63). However, electric utilities are not included among the specific source categories to which these regulations apply.

Table 3.2.2. Allowable increments for Prevention of Significant Deterioration (PSD) of air quality

Pollutant	Averaging period	Allowable increment ($\mu g/m^3$) Class I[a]	Class II[a]
Sulfur dioxide (SO_2)	3-hour	25	512
	24-hour	5	91
	Annual	2	20
Nitrogen dioxide (NO_2)	Annual	2.5	25
Particulate matter less than 10 μm in aerodynamic diameter	24-hour	8	30
	Annual	4	17

[a]Class I areas are specifically designated areas (e.g., national parks greater than 6,000 acres in area) in which the degradation of air quality is to be severely restricted. Class II areas (which include most of the United States) have a less stringent set of allowable increments.

3.3 SURFACE WATER RESOURCES

3.3.1 Hydrology

Seneca Lake is the largest of the 11 Finger Lakes in the Oswego River Basin of Central New York. The Finger Lakes were formed by about 20 cycles of glacial advances and retreats (Schuyler County 2003). Seneca Lake holds about 50% of the volume of all of the Finger Lakes. It is 35 miles long and averages about 2 miles in width. The average depth is 290 ft; the maximum depth is 651 ft. The typical lake elevation is 446 ft; flooding has been known to raise the level to a maximum of 450.2 ft. The lake rarely freezes over; since 1912 ice cover has apparently occurred only in localized, near shore-areas (SLAP-5 1999).

Greenidge Station lies to the south of the Keuka Lake Outlet which it flows into and joins Seneca Lake to the east. Keuka Lake Outlet drains the Keuka Lake watershed; the elevation of Keuka Lake is 715 ft (SLAP-5 1999).

At the U.S. Geological Survey (USGS) gauging station closest to the proposed project location (approximately 0.25 mile to the west), streamflow in the Keuka Lake Outlet averaged 120 cubic ft per second (cfs) in 2001, with a range of annual mean flows of 85 to 395 cfs over the period from 1966 through 2001 (USGS 2004). The average daily mean flows have ranged from 6 cfs in March of 2002 to 1540 cfs in May of 1996 (USGS 2004).

3.3.2 Water Quality and Use

3.3.2.1 Water Quality

Seneca Lake rates high in the quality spectrum of large U.S. lakes (SLAP-5 1999). Its water meets all drinking water standards established by the EPA under the Safe Drinking Water Act and provides Class “AA” drinking water to 70,000 residents within its watershed (SLAP-5 1999).

General clarity is about 15 ft in summer to 30 ft in winter. The water is chloride rich (150 mg/L), but well below concentrations (greater than 250 mg/L) which pose a health risk (SLAP-5 1999). The pH of Seneca Lake is slightly alkaline, 8.0 to 9.0, and varies with season and depth. Seneca Lake water is moderately hard, with total hardness concentrations of 140 – 150 mg/L (ppm $CaCO_3$). Dissolved oxygen concentrations are at or near saturation throughout the water column during the entire year (SLAP-5 1999).

Biological parameters indicate that Seneca Lake is borderline oligotrophic/mesotrophic. Very low nutrient concentrations, especially phosphate, prevent algal blooms and associated green coloration observed in smaller lakes of the region and prevent dissolved oxygen depletion in the hypolimnion during the late summer (SLAP-5 1999).

3.3.2.2 Water Use

Greenidge Station uses water for three primary purposes: noncontact cooling, service water, and potable water. Units 3 and 4 use once-through cooling water for noncontact condensing of steam exhausted from the turbines. About 93,000 gpm of water are withdrawn for this purpose from Seneca Lake through two underwater intake structures, one for each unit (Section 2.1.6.2). Service water for the entire plant (about 500 gpm) is also withdrawn from the intake serving Unit 3. Potable water (about 1.2 gpm) is supplied by the Penn Yan municipal water system.

3.3.3 Effluent Discharges

Cooling water from the units exits through their discharge pipelines to Seneca Lake via the discharge channel that flows into Keuka Lake Outlet (Section 2.1.6.2). Service water is treated prior to discharge to C pond (an unlined settling pond), which ultimately drains to Seneca Lake. C pond also receives treated wastewater from plant site activities and treated stormwater runoff from the lined coal pile. Stormwater runoff is collected at the Lockwood Landfill which has an underground leachate collection system that conveys water to an existing sedimentation pond where it is sampled and treated, if necessary. It is ultimately discharged through an outfall point to the Keuka Lake Outlet. Discharge of these water sources through their outfall points is regulated under the facility’s State Pollutant Discharge Elimination System (SPDES) permit, which limits the discharge volume and specifies effluent limitations.

Other industrial, municipal, and private water users withdraw from and discharge into the Seneca Lake watershed, but in smaller quantities than Greenidge Station (SLAP-5 1999). These discharges are regulated through SPDES permits. Fifty-one SPDES permits allow large-scale discharge into surface waters in the watershed; twenty-one allow discharge directly to Seneca Lake (SLAP-5 1999). The largest two users, Cargill

Salt Company and U.S. Salt Corporation (both of Watkins Glen, New York), each discharge about 10% of Greenidge Station's discharge to Seneca Lake (9,200 and 6,700 gpm, respectively). The next largest users are Marsh Creek Wastewater Treatment Plant in Ontario County, which discharges about 2,800 gpm to Seneca Lake, followed by Penn Yan Sewage in Yates County, which discharges about 1,260 gpm to Keuka Lake Outlet. Other users discharge much lower volumes (SLAP-5 1999).

3.3.4 Thermal Discharge

Discharge of condenser cooling water to Seneca Lake is regulated under the SPDES permit, which limits discharge to 190 million gallons per day (MGD). Actual discharges are well below this limit. The average and maximum daily discharges for August were both 145 MGD. In November the average discharge was 133 MGD, and the maximum was 135 MGD (AES Greenidge 2003a,b).

Permitted effluent temperature limits are 108°F in summer months and 86°F in winter months. The maximum allowable temperature increase under the permit is 31°F in the winter and 26°F in the summer. Actual temperatures and temperature increases are well below these limits. The highest effluent temperature in 2003 was 99°F, recorded in August (a summer month). The maximum temperature increase that month was 17°F. In November 2003 (a winter month) the maximum temperature increase was also 17°F and the maximum effluent temperature was 74°F.

3.4 GEOLOGICAL RESOURCES

3.4.1 Geology and Topography

The Greenidge Station site is located in the glaciated Allegheny Plateau physiographic province. The station and the surrounding area are underlain by a thick sequence of sedimentary rock of middle to late Devonian age (approximately 360 to 375 million years old), consisting predominantly of shale and siltstone, but also including sandstone and several distinct calcareous (limestone) layers. The strata have a slight dip toward the south.

Continental glaciation during the Pleistocene Epoch had a major influence on regional topography. Glacial erosion deepened preglacial stream valleys into a semi-parallel series of deep, narrow linear troughs that form the fiord-like basins of the Finger Lakes. Upland bedrock surfaces are mantled by varying thicknesses of glacial till (unsorted sediment deposited directly by glacier ice) and stratified glacial drift (sediments deposited by glacial meltwater). Thick sequences of glacial sediment also fill the deeper portions of the basins of the Finger Lakes.

Greenidge Station is on the western shore of Seneca Lake, south of the mouth of the Keuka Outlet stream. Seneca Lake is the largest of the Finger Lakes at 35 miles long, about 1.9 miles wide on average, and as much as 650 ft deep. Its bedrock valley extends down to about 1,000 ft below sea level (Callinan 2001). The lake basin is oriented nearly due north-south. North of the power station and west of the lake, upland surfaces slope gently eastward toward the lake. The Keuka Outlet stream, which carries outflow from Keuka Lake to Seneca Lake, occupies a deep valley, with local relief of more 150 ft. Upland elevations, and thus topographic relief, increase to the south of the power station, where the short streams draining the uplands are more deeply incised than are similar streams north of the power station.

Surficial materials at the power station site include glacial sediments and fly ash (in former waste disposal areas). Past site development activities in the area where new structures would be built for the proposed project included removal of surficial materials, exposing the bedrock surface.

Lockwood Landfill occupies a 143-acre site about 1/4 mile west of Greenidge Station. In its natural state the site had a northward slope, from an elevation of about 660 ft at the southwest corner of the property to less than 550 ft in the north end of the tract, near the Keuka Outlet stream. Silt-clay glacial till, ranging from 1 to 11 ft thick with an average thickness of about 4.5 ft, mantles the bedrock. This material is characterized as gravelly sandy clay silt to silty sand with clayey gravel, reflecting its unsorted character. Permeability of the till is very low; hydraulic conductivity values measured in the field ranged from 4.2×10^{-5} to 1.1×10^{-7} cm/sec. Site preparation for some portions of the landfill included placement of borrow soil (excavated from an adjoining area) on the ground surface to provide a minimum 5-ft thickness of soil above the groundwater table. Glacial deposits are thicker on portions of the AES property north of the waste disposal area, ranging from 25 to 80 ft thick (Criss 2004).

3.4.2 Geological Hazards

Geologic hazards are minimal at the site of the proposed project. The local bedrock is not subject to dissolution or subsidence, and the glacial sediments on the power station and landfill properties are naturally compacted mineral materials that are not subject to settlement or subsidence. Underground mining has not been conducted in the area. In the Seismic Zoning Map for the New York State Seismic Building Code proposed in 1993 by the New York State Earthquake Code Advisory Committee (Multidisciplinary Center for Earthquake Engineering Research 2004.), Yates County is included in Seismic Zone A. This is the lowest seismic risk classification in the state and the only mapped seismic zone characterized as “low risk.” In this zone there is less than a 10% chance of a peak ground acceleration of 0.09 g (that is, 9% of the acceleration of gravity) in a 50-year period. A more recent set of estimates by the US Geological Survey indicates that the peak ground acceleration with a 10% chance of occurring in a 50-year period in the Dresden area is just 0.03 g (USGS 2002).

3.4.3 Geological Resources

Mineral resources of economic value in the area surrounding Greenidge Station include sand and gravel, clay and glacial till, and natural gas (Division of Mineral Resources 2004). In 2001 twelve active sand and gravel pits and one operation for mining of clay and glacial till were active in Yates County. Five gas wells were in production in Yates County in 2001 and 2002. Production of natural gas in the state of New York has been declining since a peak year in the 1980s.

Another economic use of geologic resources in the area is underground storage of natural gas. One underground natural gas storage facility exists in Yates County (Division of Mineral Resources 2004). Another potential use of these resources is the study and collection of invertebrate fossils, which are abundant in some of the Devonian rock strata of the region. However, bedrock exposures are limited.

3.4.4 Groundwater

Groundwater is an important resource in the region. Over half of the population of Yates County relies on groundwater for drinking water supply, primarily in rural areas away from the lake shores (Winkley 2001). Permeable sands and gravels deposited by glacial meltwater form the most productive aquifers in the area, but in many areas the only source of groundwater supply is the relatively low-permeability bedrock (Keuka Lake Foundation 1996), in which groundwater occurs and moves almost entirely in fractures (Merin 1992). Domestic wells in the region typically yield less than 5 gpm (USDA Forest Service 2001).

No groundwater is used on the Greenidge Station site. Some seepage from C pond (the unlined settling pond described in Section 3.3.3) enters the shallow groundwater system. Quarterly sampling of a network of about 30 onsite monitoring wells distributedaround the property has not detected adverse effects from station operations (Eileen Reynolds, AES, personal communication to Ellen Smith, ORNL, May 25, 2004). Groundwater beneath the site discharges to Seneca Lake.

Monitoring wells at the Lockwood Landfill site allow observations of groundwater conditions, including water levels and water quality, both up- and downgradient from the disposal area. Groundwater moves from southwest to northeast, mirroring the natural topography. Depth to groundwater in shallow wells is typically between 5 and 20 ft, with greater depths recorded on the downgradient side of the landfill. Observations in pairs of shallow and deep wells indicate a strong downward gradient from the till into the underlying bedrock. Most groundwater movement is believed to occur in the upper portion of the bedrock (Criss 2004). No water supply wells exist north of the landfill between the disposal area and the Keuka Outlet stream (north and northwest of the site), where shallow groundwater moving north from the landfill area would discharge to the surface water system.

Groundwater quality at the Lockwood Landfill is strongly influenced by the chemistry of the rock units in which wells are completed. The natural chemical characteristics of site groundwater, as observed in background monitoring wells, typically include slightly alkaline pH (7.0 to 7.5) and very high hardness and alkalinity (both hardness and alkalinity are consistently above 250 mg/L). Water with these attributes is generally suitable for use as drinking water, but its hardness and its characteristically high concentrations of iron (frequently exceeding 0.3 mg/L in unfiltered samples) and total dissolved solids (450-570 mg/L) may be objectionable for some users and some types of domestic uses. Additionally, some unfiltered water samples from background wells have exceeded drinking water quality criteria for specific metals, including antimony and cadmium (Criss 2004).

Leachate collection systems within the Lockwood Landfill and groundwater underdrains beneath unlined portions of the landfill collect water that has percolated through disposed waste. This water exhibits substantially elevated levels of many constituents, but as of the end of 2002 monitoring of downgradient monitoring wells had not detected water quality changes attributable to landfill contamination (Criss 2004). The clay-rich soil and bedrock at the landfill site can be expected to have geochemical attributes that would help to retard the transport of many dissolved contaminants.

3.5 FLOODPLAINS AND WETLANDS

3.5.1 Floodplains

The entire proposed project site would be located outside the Federal Emergency Management Agency's delineated 500-year floodplain for Keuka Lake Outlet and Seneca Lake (FEMA 1987).

3.5.2 Wetlands

The proposed project would be located in an existing, developed industrial site containing no wetlands. The closest actual wetland area to the project site is about 1,200 ft to the northwest across the Keuka Lake Outlet. This wetland is about five acres in size and is classified by the U.S. Fish and Wildlife Service (FWS) as an inland forested wetland (FWS 2004a). Another wetland occurs about 1,400 ft to the north of the proposed project site along the confluence of Keuka Lake Outlet with Seneca Lake. Here, a long narrow strip of FWS-classified inland herbaceous wetland totaling about 1.5 acres in size lies on the south bank of the outlet and extends into the lake (FWS 2004a).

3.6 ECOLOGICAL RESOURCES

3.6.1 Terrestrial Ecology

The proposed project would be located in the Laurentian Mixed Forest Province (Ecological Subregion) of the United States (Bailey 1995). This province is transitional between the boreal forest and the broadleaf deciduous zones. In the Seneca Lake watershed more than 90% of the remaining forests are mixed northern hardwood and oak (SLAP-5 1999). The proposed project would occupy about 3 acres of developed industrial property in the midst of the 153-acre Greenidge Station. The proposed project site is characterized by an almost complete lack of natural ecological resources. Vegetation occurs in the project area only on isolated unpaved areas (e.g., road shoulders and cut slopes) and includes a mixture of grasses, herbaceous species (e.g., mullen), and brush consisting of sumac, ailanthus, and red cedar. Isolated patches of forest occur in the area surrounding Greenidge Station, along with open fields, residential development, and other industrial sites.

Wildlife is abundant and varied due to the variety of land uses in the Seneca Lake basin. Among the most prominent are several species of songbirds and shorebirds and mammals including white-tailed deer, beaver, groundhog, skunk, opossum, gray squirrel, Eastern coyote, red fox, muskrat, and cottontail rabbit (SLAP-5 1999). Seneca Lake has a significant concentration of wintering waterfowl. Diving ducks use the whole lake, and mallard and American black ducks concentrate around Dresden station. Other species present include greater scaup, canvasback, redhead, common goldeneye, buffelhead, common merganser, and Canada goose. The closest wildlife management area to the proposed project, the Willard Wildlife Management Area, is located across Seneca Lake in the Town of Ovid, about 5 miles east of Greenidge Station.

3.6.2 Aquatic Ecology

Seneca Lake supports a substantial fishery consisting predominantly of lake trout, smallmouth bass, and yellow perch. Other species such as rainbow trout, brown trout, landlocked-Atlantic salmon, northern pike, and largemouth bass add diversity to the fishery. In addition, alewives (sawbellies) and rainbow smelt provide a dependable forage base for trout and salmon (SLAP-5 1999). The fishery has benefited from steady annual stockings of 60,000 lake trout, 65,000 brown trout, and 24,000 Atlantic salmon. All other fish species are sustained entirely by natural reproduction. An important factor in a recent resurgence of the Seneca fishery is the New York State Department of Environmental Conservation’s (NYSDEC’s) ongoing control of the invasive, parasitic sea lamprey. The control program involves applying a highly selective chemical lampricide to known sea lamprey nursery areas in Catherine Creek and Keuka Lake Outlet at three-year intervals (SLAP-5 1999).

Another invasive species, the zebra mussel, has more recently invaded Seneca Lake and was first observed late in the summer of 1992. Today zebra mussels have colonized almost every suitable shallow-water habitat, filter-feeding on the plankton. Changes in lake water opacity, nutrient concentrations, and chlorophyll-a concentrations from the early 1900s to 1998 suggest that zebra mussels have decreased the algal concentrations in Seneca Lake and increased water clarity. Starting in 1998 and continuing through 1999 however, these trends reversed. The variability indicates the lack of complete understanding of the present extent and future impact of zebra mussels on the ecology of the lake and its fishery (SLAP-5 1999).

3.6.3 Threatened and Endangered Species

The FWS (FWS 2004b) lists 12 non-marine animal and 6 plant species, which are either threatened or endangered, that may occur in the state of New York. Of these only two species, Indiana bat (endangered) and Leedy's roseroot (threatened), are known to be found in Yates County (EPA 2004). The state of New York lists many species of animals (NYSDEC 2003a) and plants (NYSDEC 2003b) as either threatened or endangered. Some of these state-listed species are known to occur in the Seneca Lake watershed (SLAP-5 1999). Of the threatened and endangered species in the watershed, only one plant, Leedy's roseroot (state endangered, also federally threatened), has been confirmed to be in Yates County (NYSDEC 2003b). The state-listed endangered, short-eared owl (Asio flammeus) could possibly occur in Yates County (NYSDEC 2003a; SLAP-5 1999). Because the proposed project site is already highly disturbed and offers virtually no suitable habitat for any of these species, they are unlikely to occur at the site.

3.6.4 Biodiversity

The proposed project site is located within an area of the United States that exhibits reasonably good biodiversity at the state and ecoregion scales. Numerous ecosystem types and plant, mammalian, and avian species contribute significantly to the overall biodiversity. Based on (1) the variety of surviving habitats and (2) the number of species in the more visible classes of plants and animals observed in the environs, the area within a few miles of the proposed project exhibits moderately high biodiversity. The proposed project site itself exhibits little biodiversity because previous industrial development has almost completely destroyed the native habitats that were once present, as well as the wildlife communities they supported.

3.7 CULTURAL RESOURCES

Although no record exists of a cultural resources survey of the Greenidge Station property, the proposed project site has been disturbed by power plant construction and operations since the 1950s, and no cultural resources have been reported or found on or near the site (CONSOL 2002). In Yates County, 61 properties are listed on the *National Register of Historic Places* (NPS 2004). The two *National Register* properties closest to the proposed project site are the Robert Ingersoll Birthplace and the Christopher Willis House, both located in the town of Dresden about 0.5 mile northwest of the project site.

3.8 SOCIOECONOMICS

This section contains data on the socioeconomic resources most likely to be affected by the proposed project. Most of the data are for communities in Yates County, where the proposed project site is located, but some are for Ontario County and the city of Geneva because they would also experience socioeconomic impacts from the proposed project.

3.8.1 Population

Table 3.8.1 contains population data for Yates County, Ontario County, and some of the local communities most likely to be affected by the proposed project. As indicated in Table 3.8.1, both Yates County and Ontario County experienced moderate population growth (7.9% and 5.4%, respectively) between 1990 and 2000. Dresden, the community closest to the proposed project site, is a small village with around 300 residents. It is anticipated that most of the additional workers associated with construction of the proposed project would reside in the village of Penn Yan (population 5,219) or the city of Geneva (population 13,617), each of which experienced population declines between 1990 and 2000.

Table 3.8.1. Population data for Yates County, Ontario County, and selected communities

Location	1990 Population	2000 Population	Percent change 1990-2000
Yates County	22,810	24,621	7.9
Penn Yan	5,248	5,219	(0.6)
Dresden	NA	307	NA
Ontario County	95,101	100,224	5.4
Geneva	14,143	13,617	(3.7)

NA=Not available

Sources: U.S. Census Bureau 1994; U.S. Census Bureau 2004a; U.S. Census Bureau 2004b

3.8.2 Employment and Income

Table 3.8.2 contains employment and income data for Yates County and Ontario County in 2000. The unemployment rate in Yates County (6.4%) was higher than that in the United States (5.8%), but lower than that in the state of New York (7.1%). The unemployment rate in Ontario County (4.5%) was lower than both the state and national rates. Both counties had per capita incomes in 2000 lower than those of the state of New York ($23,289) and the United States ($21,587) (U.S. Census Bureau 2004b).

Table 3.8.2. Employment and income data for Yates County and Ontario County in 2000

Location	Labor force	Number Employed	Number Unemployed	Unemployment rate (%)	Per capita income ($)
Yates County	11,959	11,191	768	6.4	16,781
Ontario County	53,200	50,822	2,378	4.5	21,533

Source: U.S. Census Bureau 2004b

Table 3.8.3 contains data on employment by industry or economic sector in Yates County and Ontario County in 2000. Employment patterns are similar in both counties, with the largest sector being educational, health, and social services, followed by manufacturing and retail trade.

The largest employer in Yates County is the Penn Yan Central School District with 400 employees. Other large employers in Yates County include the Soldiers and Sailors Memorial Hospital in Penn Yan (342 full-time and 181 part-time employees), Yates County government (310 employees), and the Yates County Chapter of the New York State Association for Retarded Citizens, Inc. (190 full-time and 125 client employees) (YCIDA 2003).

Greenidge Station currently employs 44 people, the majority of whom reside in Penn Yan (85%) and Geneva (10%). Total employee payroll at Greenidge Station in 2003 was over $6.4 million (AES Greenidge 2004).

3.8.3 Housing

Table 3.8.4 contains housing data for Yates County, Ontario County, and some of the local communities most likely to be affected by the proposed project. Yates County has a relatively high vacancy rate (25.2%), probably due to the large number of tourist and vacation properties in the area. Penn Yan (6.4%) and Geneva (10.1%), the communities in which most current Greenidge Station employees reside, have much lower vacancy rates than Yates County. The housing stock in Penn Yan and Geneva is relatively old, with 56.2% and 65.3% of the housing units, respectively, built before 1940 (Table 3.8.4).

3.8.4 Water and Wastewater Services

Although many residents of Yates County rely on private wells for their water supply, residents of Penn Yan and Dresden receive their water from a water treatment facility located in Penn Yan. The Penn Yan water treatment facility has a capacity of 1.77 MGD and currently operates at about 0.8 MGD (Steve Isaacs, Yates County Industrial Development Agency, personal communication to Bo Saulsbury, ORNL, February 11, 2004).

Penn Yan also has a wastewater treatment facility with a capacity of 1.8 MGD and current use of about 1.0 MGD. For several years, however, Penn Yan's wastewater treatment system has had a recurring problem with infiltration and/or infill, in which

Table 3.8.3. Employment by industry or economic sector in Yates County and Ontario County in 2000

	Yates County		Ontario County	
Industry	**Number**	**Percent**	**Number**	**Percent**
Educational, health, and social services	3,096	27.7	12,891	25.4
Manufacturing	1,713	15.3	9,557	18.8
Retail trade	1,251	11.2	6,378	12.5
Arts, entertainment, recreation, accommodation, and food services	801	7.2	3,889	7.7
Construction	839	7.5	3,327	6.5
Professional, scientific, management, administrative, and waste management services	512	4.6	3,485	6.9
Wholesale trade	306	2.7	1,440	2.8
Agriculture, forestry, fishing and hunting, and mining	731	6.5	952	1.9
Other services (except public administration)	484	4.3	2,248	4.4
Finance, insurance, real estate, and rental and leasing	420	3.7	2,095	4.1
Public administration	423	3.8	1,732	3.4
Transportation and warehousing, and utilities	438	3.9	1,685	3.3
Information	177	1.6	1,143	2.3
Total	11,191	100	50,822	100

Source: U.S. Census Bureau 2004b

Table 3.8.4. Housing data for Yates County, Ontario County, and selected communities in 2000

	Yates County	Penn Yan	Dresden	Ontario County	Geneva
Total housing units	12,064	2,281	149	42,647	5,573
Occupied units	9,029	2,135	128	38,370	5,009
Vacant units	3,035	146	21	4,277	564
Vacancy rate (%)	25.2	6.4	14.1	10.0	10.1
Median value, owner-occupied ($)	75,600	70,400	63,200	94,100	69,300
Median rent, renter-occupied ($)	467	453	605	564	474
Units built before 1940 (%)	39.3	56.2	78.5	34.4	65.3

Source: U.S. Census Bureau 2004b

groundwater gets into the sewer system through leaks in the pipes, joints, and other structures. During periods of high groundwater flow, this additional water in the sewer system causes added demand (and cost) to the operation of the treatment system (Penn Yan 1999). The town of Penn Yan is currently trying to resolve this wastewater treatment issue. Residents of the village of Dresden rely on septic systems for wastewater disposal.

3.8.5 Local Government Revenues

The 2004 budget for Yates County is projecting over $32.6 million in total revenues, with $10.2 million coming from local property and school taxes (YCIDA 2004). In 2003, Greenidge Station paid Yates County $784,862 in property taxes and $888,877 in school taxes (AES Greenidge 2004).

3.8.6 Environmental Justice

Table 3.8.5 contains the percentages of the total population that are classified as "minority" and "below poverty" for the United States, the state of New York, Yates County, and the five Census Tracts within Yates County. Yates County and its five Census Tracts have much lower minority percentages than the United States and the state of New York. Yates County's percentage below the poverty level (13.1%) is slightly lower than that of the state of New York (14.6%), but is slightly higher than that of the United States (12.4%).

Within Yates County, Census Tract 9905 and Census Tract 9901 each have slightly higher percentages below the poverty level (16.0% and 15.2%, respectively) than

Yates County, the state of New York, and the United States. Both Census Tract 9905 and Census Tract 9901 are located in the eastern part of Yates County, between Seneca Lake and Penn Yan. The proposed project site at Greenidge Station is located within Census Tract 9901.

Table 3.8.5. Environmental justice data for the United States, the state of New York, Yates County, and the five Census Tracts within Yates County

Place	% Minority[1]	% Below Poverty[2]
United States	30.9	12.4
State of New York	38.0	14.6
Yates County	3.2	13.1
Census Tracts within Yates County		
CT 9901	4.4	15.2
CT 9902	3.0	13.2
CT 9903	2.5	9.5
CT 9904	2.4	11.6
CT 9905	3.5	16.0

[1]Includes all persons who identified themselves as not "White alone," plus those who identified themselves as both "White alone" and "Hispanic or Latino."
[2]Represents individuals below the poverty level as defined by the U.S. Census Bureau.
Sources: U.S. Census Bureau. 2004a; U.S. Census Bureau 2004b

3.9 TRANSPORTATION AND NOISE

3.9.1 Transportation

3.9.1.1 Roads

Road access to the proposed project site is from State Highway 14, a two-lane north/south highway that parallels Seneca Lake through eastern Yates County (Figure 2.1.1). In 2003, annual average daily traffic (ADT) was 2,595 vehicles on the segment of Highway 14 closest to the proposed project (i.e., between State Highway 54 and County Route 36). This traffic volume represents a "Volume/Capacity Ratio" of 0.1 (i.e., the road segment is at 10% of capacity), and the level of service on Highway 14 near the proposed project site is "very good" (Bill Piatt, New York State Department of Transportation Region 6, personal communication to Bo Saulsbury, ORNL, February 11, 2004). The New York State Department of Transportation has no road construction activities planned for Highway 14 or for any other roads in Yates County (NYSDOT 2004).

Access to the proposed project site from Highway 14 is via Lampman Road, a short, two-lane gravel road currently used by employee vehicles and delivery trucks coming to and from Greenidge Station.

3.9.1.2 Rail

Rail access to the proposed project site is from a CSX trunk rail line that is currently used to transport coal to Greenidge Station. Under current operations, a train of 50 rail cars delivers coal to the station about twice per week. Occasionally, a train of 100 cars transports coal to the Dresden area, with 50 cars moved to Greenidge Station to remove the coal, while the remaining 50 cars are parked at a railroad siding immediately north of Dresden until they can be switched with the empty 50-car section at Greenidge Station.

3.9.2 Noise

Noise can be defined as unwanted sound. Noise becomes annoying when it is loud enough to be heard above the usual background sounds to which people have become accustomed. Background levels, in turn, vary with location and time of day. Sound levels are measured in decibels (dB); measured values are normally adjusted to account for the response of the human ear, in which case they are expressed as decibels as measured on the A-weighted scale [dB(A)].

Greenidge Station sits in a rural area on the west bank of Seneca Lake. The village of Dresden, where residential dwellings line the shores of the lake, is located 1 mile northwest of the proposed project. There is no residential population within a quarter mile of the proposed project (Radder 2002). According to a survey by Goodfriend and Associates (1971), sound levels at Greenidge Station are similar to those at other industrial plants. The relatively steady noise resulting from Greenidge Station is augmented by the presence of other sound sources in the area, including vehicular traffic, farming traffic (i.e., tractors, grape harvesters) nearby passing trains, recreational activities, and other industrial activities. For example, sound levels may exceed 100 dB(A) within 50 ft of a train passing on one of the nearby railroad tracks. Although the presence of Seneca Lake precludes stationary noise sources to the east of Greenidge Station, motorboats using the lake generate noise. Residential areas are minimally affected by Greenidge Station.

Neither Torrey Township nor the City of Dresden Codes contain ordnances regarding noise. No documented, noise-related complaints associated with Greenidge Station have been identified. Past construction activities at Greenidge Station did not generate noise that triggered documented noise-related complaints.

In addition to the guideline level of 55 dB(A) given by the Environmental Protection Agency (EPA 1974), a level of 90 dB(A) is specified by the Occupational Safety and Health Administration (OSHA) (29 CFR Part 1910.95) as the maximum occupational exposure during an 8-hour period for protection against hearing loss. When worker noise exposure levels equal or exceed an 8-hour time weighted average (TWA) of 85 dB(A), the employer is required to administer a continuing effective hearing conservation program. This 85 dB(A) represents an action level. Greenidge Station has a hearing conservation program in place for all workers.

4. ENVIRONMENTAL CONSEQUENCES

This section analyzes the potential impacts to human and environmental resources resulting from construction and demonstration of the proposed multi-pollutant control system and for four reasonably foreseeable scenarios of no action. Potentially affected physical, biological, social, and economic resources are included.

4.1 ENVIRONMENTAL IMPACTS OF THE PROPOSED PROJECT

4.1.1 Land Use and Aesthetics

4.1.1.1 Land Use

On the Greenidge Station site, the proposed project would require about 3 acres of land adjacent to the existing powerhouse for construction of new facilities (Section 2.1.6.1). This land currently is dedicated to industrial uses and is mostly paved. Because construction would displace an existing parking area, a nearby vacant land area of similar size would probably be developed for parking. The land that would be occupied by a new parking lot is cleared and is dedicated to industrial use, but has not previously been developed.

Disposal of fly ash generated by project operation would be in the nearby AES-owned, double-lined Lockwood Landfill, which is a state-permitted landfill on a site that is already dedicated to waste disposal.

The proposed project would not affect offsite land use because it would be confined to an existing industrial area within the Greenidge Station and Lockwood Landfill property. As with Greenidge Station, the proposed project would be consistent with existing land use plans and local zoning. The in-migration of workers that would result from project construction would not be large enough to increase the amount of offsite land required for residential purposes (Section 4.1.9.3).

4.1.1.2 Aesthetics

Greenidge Station is visible from the surrounding local area (Figure 2.1.3), including from nearby Seneca Lake. Because the proposed project's equipment would be installed adjacent to the west side of the existing powerhouse, portions of the equipment would be visible from the west, including along nearby State Highway 14. However, because of the similarity of the architecture and colors associated with the existing and new equipment, any visible portions would blend into the existing industrial structures. From other viewpoints, including Seneca Lake, the proposed equipment would likely be obscured by the taller, existing power plant structures. Existing vegetation would also contribute in some locations to the visual screening of the proposed equipment. In summary, because the visual landscape of the Greenidge Station property is already conspicuously marked with industrial structures (Section 3.1), the visual impacts of the facilities on the property after installation of the proposed project's equipment would be indistinguishable from the existing visual impacts.

With regard to Lockwood Landfill, the proposed project would not affect the visual appearance of the landfill.

4.1.2 Atmospheric Resources and Air Quality

This section evaluates potential impacts to atmospheric resources that may result from construction or operation of the proposed project. Section 4.1.2.1 discusses effects of construction, including fugitive dust associated with earthwork and excavation. Section 4.1.2.2 discusses operational effects, particularly with regard to changes from existing operations.

4.1.2.1 Construction

During construction of the integrated multi-pollutant control system, temporary and localized increases in atmospheric concentrations of NO_x, CO, SO_2, VOCs, and particulate matter would result from exhaust emissions of workers' vehicles, heavy construction vehicles, diesel generators, and other machinery and tools. Construction vehicles and machinery would be equipped with standard pollution-control devices to minimize emissions. These emissions would be very small compared to regulatory thresholds typically used to determine whether further air quality impact analysis is necessary [40 CFR Part 93.153(b)].

Fugitive dust would result from excavation and earthwork. The proposed project would use a total of about 3 acres of previously disturbed land, primarily for the new ESP or baghouse and surrounding access space. Limited site clearing and grading would be required because the land currently serves as a paved laydown area and contractor parking lot adjacent to the existing powerhouse for Units 3 and 4. A new paved parking lot would likely be built on vacant, cleared land near the powerhouse to compensate for the loss of the existing lot. The temporary impacts of fugitive dust on offsite ambient air concentrations of particulate matter less than 10 µm in aerodynamic diameter (PM-10) would be localized because of the small construction area, the limited amount of clearing and grading, and the relatively rapid settling of fugitive dust due to its relatively large size. Sprinkling of exposed soils with water would be conducted as necessary to minimize fugitive dust emissions.

4.1.2.2 Operation

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 (NH_3), plantwide air emissions would decrease or continue at the same level (Section 2.1.7.1). SO_2 emissions would decrease from 19,450 tons per year currently to 6,683 tons per year. NO_x emissions would decrease from 3,190 tons per year currently to 2,030 tons per year. PM-10 and PM-2.5 emissions are assumed to continue at their existing level of 95 and 42 tons per year, respectively (Section 2.1.7.1). CO and volatile organic compound (VOC) emissions would also be expected to remain at their current level (i.e., 92 and 18 tons per year, respectively). Plantwide Hg emissions would decrease from about 36 lb per year currently to about 22 lb per year. NH_3 emissions would increase from near zero to about 280 lb per year. Plantwide HCl and HF emissions would decrease to about 147 and 19 tons per year, respectively, compared with current emissions of 409 and 50 tons per year, respectively. As discussed in Section 2.1.7.1, annual CO_2 emissions would probably not change substantially from the current level of 1,300,000 tons.

The existing 250-ft stack that serves Unit 3 and 227-ft stack that serves Unit 4 would continue to be used (the stack tops are at the same elevation, but the base elevation of the Unit 4 stack is 23 ft above the Unit 3 stack base elevation). While the Unit 3 stack parameters would not change and the Unit 4 stack height and flue diameter would remain the same during the demonstration, the Unit 4 exit temperature and exit velocity would decrease. The exit temperature would decrease from the current 235°F to 153°F, and the exit velocity would drop from the existing 46 miles per hour to 31 miles per hour. Consequently, the decreased exit temperature and exit velocity during the demonstration would decrease the plume rise from the Unit 4 stack, which could result in increased downwind ground-level concentrations of those air pollutants experiencing little or no decrease in stack emissions.

An analysis of the magnitude of the changes in ground-level pollutant concentrations resulting from changes in Unit 4 stack parameters was conducted using the EPA-approved SCREEN3 air dispersion model (EPA 1995). SCREEN3 was used because the nearest wind data required by more detailed models are recorded at Penn Yan, which is located about 7 miles to the west of Greenidge Station (Section 3.2.1), and because the SCREEN3 results are conservative (forming an upper bound) using a full range of potential meteorological conditions. Because the height of the Unit 4 stack is approximately 2.5 times the height of the adjacent powerhouse (i.e., Good Engineering Practice stack height), wake effects from building downwash were not considered. Because increased ground-level concentrations resulting from a lower plume height would be maximized in elevated terrain, locations representing the steepest rise in terrain within 4 miles of the power plant were selected for use in the model.

The results from the model were applied to particulate emissions from Unit 4, conservatively assuming that no reduction in emissions resulting from the proposed project would occur. Hourly emissions were calculated by adjusting the 2002 base year emissions (Table 2.1.1) by the 80% capacity factor (i.e., dividing by 0.8), a reasonable assumption given that Unit 4 is usually at peak capacity when it's operating. Conversion factors were used to adjust the maximum 1-hour concentrations predicted by SCREEN3 to 24-hour and annual averages (EPA 1992), as required for comparison with applicable particulate standards.

The maximum increases in PM-10 concentrations were predicted to be 2 $\mu g/m^3$ for a 24-hour averaging period and 0.4 $\mu g/m^3$ for an annual averaging period. The maximum increases in PM-2.5 concentrations were predicted to be 1 $\mu g/m^3$ for a 24-hour averaging period and 0.2 $\mu g/m^3$ for an annual averaging period. These increases were predicted to occur about 1.5 miles to the south of Greenidge Station in elevated terrain at an elevation about 50 ft above the stack top elevation. In actuality, the frequency of winds from the north (which would transport emissions to the south) is likely to be low, as indicated by the Penn Yan wind rose (Figure 3.2.1).

The maximum increases in predicted PM-10 and PM-2.5 ground-level concentrations resulting from the decrease in Unit 4 plume rise were compared with the applicable NAAQS (Table 4.1.1) and the PSD Class II increments (Table 4.1.2). These comparisons are not regulatory requirements but are used as metrics in this analysis to evaluate the potential significance of the increases. As indicated in Table 4.1.1, the sum

Table 4.1.1. Ambient air quality standards impact analysis for the proposed project

Pollutant	Averaging period	NAAQS[a] (μg/m^3)	Maximum modeled increase (μg/m^3)	Ambient background concentration[b] (μg/m^3)	Total impact[c] (μg/m^3)	Total impact as a percentage of NAAQS
PM-10[d]	24-hour	150	2	42	44	29
	Annual	50	0.4	19	19.4	39
PM-2.5[e]	24-hour	65	1	36	37	57
	Annual	15	0.2	11.8	12	80

[a] National Ambient Air Quality Standards (NAAQS). The NAAQS are established in accordance with the Clean Air Act to protect public health and welfare with an adequate margin of safety.
[b] At nearest monitoring station.
[c] The sum of the maximum modeled increase and the ambient background concentration.
[d] PM-10 = particulate matter less than 10 μm in aerodynamic diameter.
[e] PM-2.5 = particulate matter less than 2.5 μm in aerodynamic diameter.

Table 4.1.2. Prevention of Significant Deterioration (PSD) impact analysis for the proposed project

Pollutant	Averaging period	PSD Class II increment[a] (μg/m^3)	Maximum modeled increase (μg/m^3)	Percentage of PSD Class II increment
PM-10[b]	24-hour	30	2	7
	Annual	17	0.4	2

[a]PSD increments are standards established in accordance with the Clean Air Act provisions to limit the degradation of ambient air quality in areas in attainment of the National Ambient Air Quality Standards.
[b]PM-10 = particulate matter less than 10 μm in aerodynamic diameter.

of the maximum increase in modeled 24-hour PM-10 concentration (2 μg/m^3) added to the 24-hour background concentration of 42 μg/m^3 in 2003 at the nearest monitoring station in Niagara Falls (Section 3.2.2) yields a total of 44 μg/m^3, which is 29% of the corresponding NAAQS of 150 μg/m^3. The sum of the maximum increase in modeled annual PM-10 concentration (0.4 μg/m^3) added to the annual background concentration of 19 μg/m^3 at Niagara Falls yields a total of 19.4 μg/m^3, which is 39% of the corresponding NAAQS of 50 μg/m^3. Similarly for PM-2.5, the sum of the maximum increase in modeled 24-hour PM-2.5 concentration (1 μg/m^3) added to the 24-hour background concentration of 36 μg/m^3 in 2003 at the nearest monitoring station in Rochester (Section 3.2.2) yields a total of 37 μg/m^3, which is 57% of the corresponding NAAQS of 65 μg/m^3. Finally, the sum of the maximum increase in modeled annual PM-2.5 concentration (0.2 μg/m^3) added to the annual background concentration of 11.8 μg/m^3 at Rochester yields a total of 12 μg/m^3, which is 80% of the corresponding NAAQS of 15 μg/m^3. In each of the above cases, the background concentrations contribute much more to the respective totals than the maximum predicted increases associated with the proposed project. Because the nearest air monitoring stations are distant from Greenidge Station (Section 3.2.2) in locations likely to have higher ambient particulate concentrations, the above estimates are likely to form an upper bound of actual expected concentrations and percentages of the standards.

As an additional analysis, maximum increases in modeled concentrations were compared directly with the PSD Class II increments for PM-10 (there currently are no PSD increments for PM-2.5). As indicated in Table 4.1.2, the maximum increase in modeled 24-hour PM-10 concentration (2 $\mu g/m^3$) is 7% of the corresponding increment of 30 $\mu g/m^3$. The maximum increase in modeled annual PM-10 concentration (0.4 $\mu g/m^3$) is 2% of the corresponding increment of 17 $\mu g/m^3$. No modeling was performed at Lye Brook Wilderness Area (the nearest PSD Class I area about 200 miles to the east-northeast) where the change in Unit 4 plume height would have a negligible effect.

The SCREEN3 model was also used to predict the maximum downwind NH_3 concentration. Because NH_3 emissions would increase from near zero rather than remaining the same (as was assumed for particulate emissions), the location of maximum concentration was predicted to occur at a slightly different location, about 0.6 mile to the south-southwest of Greenidge Station in terrain at an elevation about 50 ft below the stack top elevation. The frequency of winds from the north-northeast (which would transport emissions to the south-southwest) is likely to be low (Figure 3.2.1). The maximum NH_3 concentration was predicted 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.

No air dispersion modeling was performed for other pollutants. SO_2 and NO_x emissions from Unit 4 would decrease during the demonstration by about 95% and 65%, respectively (Table 2.1.1). These reductions are greater than the maximum increase in downwind concentrations predicted as a consequence of the decreased plume height (as obtained from the modeling of particulate emissions using SCREEN3). Specifically, because the SCREEN3 modeling indicated that the decreased plume height would increase downwind concentrations by a maximum factor of 2.5, emissions reductions of at least 60% (resulting in Unit 4 emissions during the demonstration of no more than 40% or original emissions) would result in no increase in concentrations at any downwind location (40% oof 2.5 equals 1). Consequently, a net improvement in air quality associated with SO_2 and NO_x concentrations would result. SO_3 emissions are expected to decrease by the same percentage as SO_2 emissions, with similar air quality improvement. The 95% reduction in Unit 4 emissions of HCl and HF would more than offset the increase associated with a lower plume height, and the reduction in Hg emissions of at least 60% would approximately offset the maximum increase. Because power plants are not large emitters of CO and VOCs (Table 2.1.1) and because there would be no change in emissions associated with the demonstration, these pollutants were not evaluated further. Because CO_2 is stable in the atmosphere and essentially uniformly mixed throughout the troposphere and stratosphere, CO_2 impacts resulting from no change in emission levels at Greenidge Station would also remain unchanged.

At times in the past, concerns have been raised about fugitive dust blown offsite from the Lockwood Landfill. The proposed project would not affect the frequency or severity of this type of occurrence, but planned increases in landfill height could increase the incidence of problems with fugitive dust. To reduce the generation of fugitive dust, the landfill operators have increased the wetting and compaction of fly ash and are implementing a new landfill operations plan designed to reduce wind exposure of active disposal areas (J.A. Daigler & Associates 2003).

4.1.3 Surface Water Resources

4.1.3.1 Construction

Construction activities for the proposed project would be limited to 3 acres of developed industrial property in the midst of the 153-acre Greenidge Station and adjacent to the existing powerhouse for Units 3 and 4. Because the area was previously graded and paved and currently serves as a parking lot, it is ecologically highly disturbed. The construction area does not encompass any existing body of water.

Construction of the proposed project would generate small amounts of both solid and liquid wastes including solvents, paints, coatings, adhesives, and empty containers. Existing facilities for containment and treatment of runoff and spills on the power plant site would be engaged to help prevent adverse effects on offsite surface waters. In addition, as necessary and appropriate, standard engineering practices for the prevention or minimization of runoff, erosion, and sedimentation from the construction site to offsite surface waters would be employed. The New York State Department of Environmental Conservation's (NYSDEC's) regulations and guidelines governing construction activities would be followed. Prompt containment and clean-up of accidental spills of harmful materials would be conducted in accordance with an appropriate spill prevention, control, and countermeasure plan and best management practices plan. Thus, project construction is not likely to have appreciable adverse effects on area surface waters.

4.1.3.2 Operation

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 circulating dry scrubber 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 (Section 2.1.6.2). 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. Wastewater effluents must be treated to meet the standards set forth in the State Pollutant Discharge Elimination System (SPDES) permit before being discharged to Seneca Lake. Hazardous wastes are removed from the site by a waste management contractor for disposal at an authorized facility. No measurable effects on the water quality of Seneca Lake would be expected.

Due to a reduction in air emissions (Section 2.1.7.1) 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.

4.1.4 Geological Resources

4.1.4.1 Rock, Soils, and Mineral Resources

Construction for the proposed project would not affect the availability or accessibility of rock or mineral resources. Only limited excavation is expected, and any excavated material probably would be used within the project as fill. Sand and crushed stone that would be used in construction are readily available in the region, and requirements for these materials would be modest due to the modest size of the new facilities. No agricultural soils would be removed from potential production. Construction of new facilities would not preclude future access to any undiscovered natural gas that might be present deep underground.

Due to low topographic relief and the previous excavation of the project site (Section 3.4.1), little soil erosion would be expected during construction. Erosion of exposed surfaces and soil stockpiles would be limited through standard management practices, consistent with requirements of the NYSDEC SPDES General Permit for Stormwater Discharges from Construction Activity (NYSDEC 2003c).

The lime required for operation of the proposed project, which would be acquired commercially, would be produced from limestone, which is an abundant resource in the surrounding region. Glacial till soil for construction and capping of the Lockwood Landfill also is abundant in the area and can be obtained from land adjacent to the landfill.

4.1.4.2 Groundwater

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.

Disposal of waste generated by the proposed project (Section 4.1.7.2) would be unlikely to affect groundwater quality because the waste would be placed in an engineered landfill that 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 (Section 3.4.4). 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 (Section 4.1.7.2).

4.1.4.3 Geological Hazards

Because only minimal geologic hazards are associated with the proposed project site (Section 3.4.2), geologic conditions would be unlikely to contribute to adverse impacts from or to the proposed project.

4.1.5 Floodplains and Wetlands

4.1.5.1 Floodplains

The entire proposed project site would be located outside the 500-year floodplain of Keuka Lake Outlet and Seneca Lake. Therefore, neither construction nor operation of the proposed project would have adverse impacts on the Keuka Lake Outlet and Seneca Lake floodplain.

4.1.5.2 Wetlands

Construction and operation of the proposed project would have no adverse effects on wetlands because none are present on or adjacent to the project location. Runoff and spills from the site would not reach wetlands due to use of measures discussed in Sections 4.1.3.1, and 4.1.3.2.

Because operation of the proposed project would reduce Hg emissions, a slight benefit to area wetlands would be provided by reducing Hg deposition and potential build-up of Hg levels in wetlands and the ecological communities they support.

4.1.6 Ecological Resources

4.1.6.1 Terrestrial Ecology

Because the proposed project would be located in an area that is highly disturbed and completely industrialized (predominantly a parking lot), and that supports almost no native plant or animal communities, neither construction nor operation of the proposed facility would adversely affect terrestrial ecological resources.

Due to NH_3 injection into flue gas to control NO_x emissions, NH_3 emissions would increase from near zero to about 280 lb per year (Section 2.1.7.1). This NH_3 would be widely dispersed and ultimately deposited to terrestrial and aquatic ecosystems through dry and wet deposition. Wineries, such as those in the local area, typically use nitrogen-based fertilizer at about 10 to 40 lbs per acre per application (Penn State 2002). Any fertilization effect from the NH_3 emissions due to the proposed project would be miniscule due to the constant slow rate of emission (less than 1 lb per day) and large dispersal area. For example, if 20 lb of NH_3 fertilizer per acre were applied once per year to the 10,414 acres of vineyards in the Finger Lakes Region (Uncork New York 2004), then the NH_3 emissions from the proposed project would represent only about 0.14% of the total from vineyards, not considering other agricultural uses in the area.

Operation of the proposed project would reduce Hg emissions and provide a slight benefit to terrestrial ecosystems in the area by reducing Hg deposition and potential build-up of Hg levels in soils, water, and biota.

4.1.6.2 Aquatic Ecology

Because appropriate engineering practices for (1) preventing or minimizing runoff, erosion, and sedimentation from the project site to offsite surface waters, and (2) the prompt containment and clean-up of accidental spills would be implemented, construction of the proposed project would have negligible impacts on the fish, birds, and wildlife of Seneca Lake and Keuka Lake Outlet (Section 4.1.3)

During operation of the proposed project, Seneca Lake's biota would be negligibly affected by the potential 93-gpm reduction of return water. Similarly, the biota would be negligibly affected by the project's NH_3 emissions (Section 4.1.6.1).

Because operation of the proposed project would reduce Hg emissions, a slight benefit to aquatic ecosystems in the area would be provided by reducing Hg deposition and potential build-up of Hg levels in sediments and water.

4.1.6.3 Threatened and Endangered Species

Federal- and state-listed threatened and endangered species (Section 3.6.3) are not known to occur, and are unlikely to occur, on the proposed project site due to its highly disturbed nature. Any effects of the proposed project on threatened and endangered species would likely be marginally beneficial as a result of expected reductions in Hg, NO_x, SO_2, HCl, HF, and particulate emissions.

In compliance with Section 7 of the Endangered Species Act of 1973, as amended, DOE requested consultation with the U.S. Fish and Wildlife Service (FWS) regarding potential impacts of the proposed project on threatened and endangered species (Appendix A). The FWS response indicated that, except for occasional transient individuals, no federal-listed species or critical habitat for such species are known to exist in the project impact area, and that no further Endangered Species Act coordination or consultation with FWS is required (Appendix A).

4.1.6.4 Biodiversity

Given adequate collection and treatment of runoff during construction and operation of the proposed project, neither of these activities would adversely affect biodiversity of the surrounding ecosystems. Both local and far-field biological diversity might realize a net beneficial, but probably immeasurable, effect as a result of expected reductions in Hg, NO_x, SO_2, HCl, HF, and particulate emissions.

4.1.7 Waste Management

4.1.7.1 Construction

Construction of the proposed project would generate solid wastes in types and amounts typical of construction projects. Wastes would include packaging from materials transported to the site, scrap materials, metals and other materials from dismantling the existing Unit 4 ESP, and demolition debris from removal of the existing waste oil storage shed and the parking lot surface. Metal waste would be sold as scrap. Some dismantled building material would probably be used on the site as fill material. The remaining solid wastes would be transported for disposal in one of the municipal landfills serving the region (Section 2.1.7.3). The volume of landfilled waste would be very small in comparison with the capacity of the 387-acre Ontario County landfill, which is permitted to accept 624,000 tons [approximately equivalent to 624,000 cubic yards (yd^3)] per year of municipal solid waste and has a potential total capacity of over 21 million yd^3 (Casella Waste Systems, Inc. 2003). The disposal of project construction waste would not measurably affect that landfill's potential operating life.

4.1.7.2 Operation

The proposed project would increase the quantity of fly ash generated by Greenidge Station by about 50%, from the current 59,000 tons per year to an estimated 89,000 tons per year (Table 2.1.1). Fly ash generation from Unit 4 would increase annually from 40,000 tons to 70,000 tons. 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 (Section 2.1.7.3).

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. 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 is not a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA).

Beneficial reuse of some or all of the fly ash from the proposed project would reduce the need for landfill disposal and could reduce demands for other materials that the fly ash replaces. Although fly ash is commonly used as a cementitious material in concrete, this is not likely to be an option for fly ash from the proposed project. The fly ash currently generated at Greenidge Station contains too much unburned carbon to be suitable for this purpose, and ash waste from the proposed project can be expected to have similar limitations. However, because it would contain substantial amounts of lime and other calcium compounds, the fly ash from the proposed project might be suitable for use as a soil amendment, probably after mixing it with treated sewage sludge. Project participants have identified a potential customer for this material and estimate that up to 20,000 tons per year could be used for this purpose. Other potential uses also would be explored.

If not beneficially reused, fly ash from the proposed project would be transported to the Lockwood Landfill for disposal. The ash would be commingled with fly ash from Unit 3 and other solid wastes generated in minor quantities at Greenidge Station. The 143-acre Lockwood Landfill site has been used for disposal of Greenidge Station fly ash and related wastes since 1979. In 2003, the site was calculated to have a potential remaining waste disposal capacity of 3.3 million yd^3 (J.A. Daigler & Associates 2003). This calculation forms an upper bound for remaining capacity because it assumes full site utilization, a final maximum elevation of 785 ft above mean sea level (approximately 85 ft above the current peak elevation), NYSDEC approval of future disposal designs, and continued renewal of the facility's 5-year permits. By using this calculation with current waste generation rates and assuming a waste density of one ton per yd^3, an estimate is derived that the site could accommodate Greenidge Station wastes through 2057. If all of the waste from the proposed project were landfilled, resulting in a 50% increase in waste volume beginning in 2006, the landfill would reach capacity about 17 years sooner (in 2040). Even with less optimistic assumptions about landfill capacity, it is apparent that the landfill site could accommodate fly ash from the proposed project until well beyond the 12-month demonstration period of performance testing and monitoring (see Section 5 regarding landfill sufficiency over the period of commercial operation).

Landfill disposal of ash has the potential to affect groundwater and surface water as a result of leaching of landfilled fly ash. Leachate generated within the Lockwood Landfill drains to the leachate collection system within lined portions of the landfill and to groundwater underdrains below unlined portions. These drains discharge by gravity flow to the adjacent sedimentation pond, which also receives surface water runoff from the landfill area. No active water treatment processes are employed in this pond, but suspended material and some dissolved contaminants (such as iron and manganese) settle out of the water. A few times each year, water from the pond is pumped to Keuka Lake Outlet after sampling and analysis have ascertained that the water quality meets the requirements of the SPDES discharge permit. If permit requirements were not met, water could be treated before being discharged. Monitoring data from a discharge event in 2003 (Table 4.1.3) show that the quality of the water in the pond easily met all of the permit requirements.

Changes in the composition of the Unit 4 fly ash due to the proposed project could affect the chemistry of Lockwood Landfill leachate and thus of discharges to Keuka Lake Outlet. Monitoring of Lockwood Landfill leachate done as part of the landfill groundwater monitoring program found elevated levels of several constituents (Table 4.1.4). Total dissolved solids in the leachate were much higher than in background groundwater (Section 3.4.4). The principal dissolved ions in the leachate were calcium, magnesium, and sulfate. Other dissolved substances found in elevated concentrations are commonly found in coal or pyrite, which is one of the minor waste streams codisposed with ash in the Lockwood Landfill. Most samples were similar to the groundwater with neutral to slightly alkaline pH, but one sample had a slightly acidic pH of 5.9. Because the ash from the proposed project would be similar to the ash currently generated, but with higher levels of calcium and sulfate compounds, the overall chemical character of the leachate would not be changed, but there could be higher concentrations of calcium and sulfate. These substances are not likely to settle out in the sedimentation pond, so they probably would be discharged to Keuka Lake Outlet. Calcium and sulfate are not toxic and there are no permit limits for these substances in pond discharges. Any effects on water quality would be dissipated by dilution in the stream and in Seneca Lake.

Increased removal of Hg in plant emissions would lead to increased Hg concentrations in Greenidge Station fly ash. Research on leaching of Hg from fly ash indicates that there should be negligible effects on Hg levels in Lockwood Landfill

Table 4.1.3. State Pollutant Discharge Elimination System (SPDES) permit limits and reported values for discharge from the Lockwood Landfill sedimentation/neutralization basin

Effluent parameter	Discharge limit (daily maximum value)[a]	Value measured in November 2003 discharge event[b]
Flow (gallons/day)	250,000[c]	178,571
Aluminum (total; mg/L)	2.4	<0.05
Cadmium (total; mg/L)	0.11	<0.005
Copper (total; mg/L)	1.0	<0.01
Iron (total; mg/L)	4.0	0.1
Zinc (total; mg/L)	2.0	<0.01
Mercury (total; mg/L)	0.0008[d]	<0.0002
Manganese (total; mg/L)	3.0	0.02
Total suspended solids (mg/L)	50	<4
Arsenic (total; mg/L)	0.1	<0.02
Selenium (total; mg/L)	0.07	0.01
pH (pH units)	range: 6.0 to 9.0	8.1

[a]New York State Department of Environment and Conservation (NYSDEC) State Pollutant Discharge Elimination System (SPDES) Discharge Permit Number NY-1007069, AES Greenidge, L.L.C.: Lockwood Disposal Facility, Modification Date June 7, 1999.

[b]AES Greenidge, "AES Eastern Energy NPDES/SPDES Discharge Monitoring Reports," Eileen Reynolds, December 16, 2003. Total volume of discharge, which occurred over a period of several days, was about 1.5 million gallons.

[c]Maximum flow shall not exceed 140,000 gallons/day if stream flow measured in Keuka Lake Outlet at Dresden is less than 27 ft^3/sec.

[d] Modified from 0.002 mg/L to 0.0008 mg/L, in accordance with NYSDEC letter of July 22, 2004. See Appendix C.

leachate. Leachability testing of ash from three projects that demonstrated the use of activated carbon injection for Hg control found low rates of Hg release (Senior et al. 2003). Hg concentrations in waste extracts generated with the Toxicity Characteristic Leaching Procedure (TCLP), which is prescribed in regulations under RCRA and is designed to mimic leaching conditions in a municipal solid waste landfill, ranged from undetectable (less than 0.00001 mg/L) up to 0.00007 mg/L. Values obtained with the Synthetic Groundwater Leaching Procedure (SGLP), which is more representative of conditions in most coal ash landfills, ranged from undetectable (less than 0.00001 mg/L) up to 0.00005 mg/L. All reported Hg concentrations were well below potentially applicable criteria, including the primary drinking water standard of 0.002 mg/L, water quality criteria for protection of aquatic life (0.0014 mg/L for acute exposure and 0.00077

Table 4.1.4. Selected data from monitoring of leachate collection drains at Lockwood Landfill during 2002

Parameter	Highest level reported during 2002[a]
Total dissolved solids (mg/L)	3330
Alkalinity (mg/L)	493
Hardness (mg/L)	1687
Aluminum (total; mg/L)	7.1
Boron (total; mg/L)	20.5
Calcium (total; mg/L)	519
Iron (total; mg/L)	79
Manganese (total; mg/L)	2.2
Magnesium (total; mg/L)	105
Selenium (total; mg/L)	0.2
Sulfate (mg/L)	2280
pH (pH units)	5.9 to 8.3[b]

[a]Data included in Criss 2004.
[b]Range of values reported.

mg/L for chronic exposure; EPA 2002), and the threshold for identifying a material as a hazardous waste (0.200 mg/L). Only one ash source in the study produced extracts with detectable Hg concentrations. That ash had total Hg concentrations ranging from 0.2 to more than 0.5 µg/g (200 to more than 500 ppb). Given these values and the 20-fold dilutions used in the leachability tests, the highest measured extract concentrations indicate release of somewhere between one-five-hundredth and one-fourteenth of the Hg in the ash. If treated effluents containing similar leachates were discharged to Keuka Lake Outlet, no violation of water quality standards would result. Other research has found that leaching of Hg from fly ash is dependent on pH, with greater releases occurring at lower (acidic) pH (Schroeder et al. 2003). Thus, the slightly alkaline pH of natural waters at the Lockwood Landfill site could limit Hg release.

The proposed project would not change the requirements and eventual process for closure and post-closure care of the landfill. Final cover would be placed over the entire facility to limit infiltration and thus reduce future leaching of the waste. The multilayer final cover would consist of a low-permeability synthetic membrane layer overlain by a permeable geosynthetic drainage layer and a protective soil layer at least 2 ft thick. Closure of the Lockwood Landfill would be expected to include final covering of old unlined waste areas, thus reducing potential future impacts from the entire facility. Post-closure care would be provided for a 30-year period, as mandated under NYSDEC permitting requirements for landfills.

4.1.7.3 Hazardous Waste

Operation of the proposed project’s SCR system could result in generation of a hazardous waste. Catalysts used in the SCR process lose their reactivity over time and would need to be replaced or regenerated after about 3 years. No catalyst replacement or regeneration is expected during the 12-month demonstration period (see Section 5 regarding catalyst replacement over the period of commercial operation).

Construction and operation of the proposed project would not be expected to introduce any other new hazardous wastes that are not already generated by operation of Greenidge Station. However, the amounts of paint, solvents, and lubricants used, recycled, or transported for disposal could increase slightly. Existing Greenidge Station hazardous waste handling and disposal procedures would be employed for the proposed project (Section 2.1.7.4).

4.1.8 Cultural Resources

In compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, DOE requested a consultation with New York's State Historic Preservation Officer (SHPO) regarding a determination of the potential for impacts associated with the proposed project on any historic resources that may be listed in or eligible for the *National Register of Historic Places* or that may have local importance (Appendix B).

Impacts from construction and operation of the proposed project are not likely, however, because the project site has been disturbed since the 1950s, no cultural resources have been reported or found on or near the project site, and the two *National Register* properties closest to the project site are about 0.5 mile to the northwest.

4.1.9 Socioeconomic Resources

The socioeconomic impacts of the proposed project would be most noticeable during the 12-month construction period, especially when the peak construction work force (100 to 150 workers) would be on the site. Because existing personnel would continue to operate Greenidge Station during demonstration of the proposed project, no additional influx of additional workers during project operations would result.

In addition to the 100 to 150 direct jobs that would be created by project construction, a number of indirect jobs could be created as a result of the purchases of goods and services by the project participants and construction workers. Employment multipliers developed for the state of New York indicate that each direct construction job leads, on average, to the creation of 1.57 indirect jobs (DARME 1996). However, this employment multiplier is likely to be too high for the proposed project because of the short construction period (12 months) and the probability that few construction workers would relocate to the area permanently. So, this analysis assumes a lower employment multiplier of 1.00 (i.e., 1 indirect job for every 1 direct job). Given this assumption, roughly 100 to 150 indirect jobs could be created during the peak construction period, for a total of roughly 200 to 300 new jobs in the project area (100 to 150 direct jobs plus 100 to 150 indirect jobs). The following subsections discuss the potential socioeconomic impacts of the proposed project, particularly those associated with this direct and indirect employment.

4.1.9.1 Population

The construction work force would be expected to come from outside the immediate project area and would either commute from their homes to the project site daily or stay temporarily in area hotels and motels (CONSOL 2002). To account for these two types of workers, this analysis assumes that 50% of the peak construction work force (50 to 75 workers) would commute from home daily, while another 40% (40 to 60 workers) would stay temporarily in hotels or motels. Although it is not likely that many of the construction workers would relocate to the project area permanently (i.e., for longer than the 12-month construction period), this analysis assumes as a conservative estimate that 10% of the peak work force (10 to 15 workers) would relocate permanently.

Past experience with large, multi-year power plant construction and refurbishment projects indicates that approximately 60% of the in-migrating work force is accompanied by family, while the remaining 40% is not (NRC 1996). However, for this relatively small, 12-month construction project, it is more reasonable to expect that none of the workers staying temporarily in hotels or motels would be accompanied by family, and that only 40% of the workers relocating permanently (4 to 6 workers) would be accompanied by family.

Assuming that 4 to 6 workers would relocate permanently with their families, and assuming the average household size of 2.61 persons for the state of New York (U.S. Census Bureau 2004b), the permanent population in the project area would increase by roughly 10 to 16 residents as a result of direct employment. The indirect jobs that could be created would be less specialized than the direct construction jobs, and would be even more likely to be filled by existing area residents. Accordingly, this analysis assumes that none of the indirect work force would relocate to the project area during the construction period.

Combining the population growth that would occur due to workers staying in the area temporarily without families (40 to 60 workers), workers relocating permanently without families (6 to 9 workers), and workers relocating permanently with families (4 to 6 workers, with 6 to 9 family members), the peak construction period would result in roughly 56 to 84 additional residents in the project area. This population growth would represent roughly 0.2% to 0.3% of Yates County's population of 24,621. The potential impacts of this population growth are discussed below in Sections 4.1.9.3 (Housing) and 4.1.9.4 (Water and Wastewater Services).

4.1.9.2 Employment and Income

The 200 to 300 total new jobs (100 to 150 direct jobs plus 100 to 150 indirect jobs) that could be created during the peak construction period would represent less than 2.5% of the total labor force in Yates County in 2000. Although the direct jobs would go to workers from outside the immediate project area, most (if not all) of the indirect jobs would go to existing residents in Yates and Ontario counties. Because existing personnel would continue to operate Greenidge Station during demonstration of the proposed project, no new employment would be associated with project operations. Accordingly, construction of the proposed project would have a temporary positive effect on local employment by creating indirect jobs, but gains in local employment would likely be lost following completion of project construction.

Because the construction work force would come from outside the immediate project area, construction wages would not have a large effect on total or per capita income in Yates County. However, the wages paid to existing area residents through indirect jobs created during the construction period would have a small positive effect on total and per capita income.

4.1.9.3 Housing

The 10 to 15 new construction-related households (i.e., the households of workers relocating permanently with and without families) assumed as an upper bound in this analysis would represent less than 0.5% of the 3,035 vacant housing units in Yates County in 2000. This level of increased demand is not likely to have an adverse effect on the availability or cost of housing in Yates County.

Because many of the construction workers would stay in area hotels and motels, the availability and cost of tourist lodging in the summer season could be a larger issue than that of housing the construction workers who relocate permanently. The hotels and motels themselves are not likely to lose business, as they could rent rooms to the construction workers, but the wineries, restaurants, and other local businesses that rely on tourism could be adversely affected if tourists are not able to find lodging in the area. However, given the large number of tourist lodging facilities in the area, the short duration of the construction period, and the fact that some of the construction work would occur outside the tourist season, this economic impact is expected to be relatively minor.

4.1.9.4 Water and Wastewater Services

Because many of the 100 to 150 workers expected during the peak construction period would stay in the project area temporarily in hotels and motels or permanently as new residents, there would be additional demand for water and wastewater services. As discussed in Section 3.8.4, the Penn Yan water treatment facility has excess capacity of 0.97 MGD. This excess capacity would be more than enough to meet the additional demand for water associated with the peak construction work force.

The Penn Yan wastewater treatment facility has excess capacity of 0.8 MGD (Section 3.8.4), which also would be more than enough to meet the additional wastewater needs associated with the peak construction work force. However, the need to provide additional wastewater services for the construction workers could slightly exacerbate existing problems with the Penn Yan wastewater treatment system during periods of high groundwater flow (Section 3.8.4).

4.1.9.5 Local Government Revenues

Because pollution control equipment is exempt from property taxation in the state of New York, the proposed project would not add to the assessed value of the existing Greenidge Station for property tax purposes and would not result in additional property tax revenues for Yates County.

In addition to the New York state sales tax rate of 4.25%, Yates County and Ontario County have local sales tax rates of 4.0% and 3.0%, respectively (NYSDTF 2004). Therefore, local purchases of materials for project construction and local purchases of goods and services by construction workers would result in some additional sales tax receipts for the counties. However, the overall effect of these revenue increases for local governments would be relatively minor because of the limited local purchases of materials, moderate number of construction workers (100 to 150 workers during the peak construction period), and limited period of construction (Section 2.1.4).

4.1.9.6 Environmental Justice

As discussed in Section 3.8.6, the percentages of residents classified as "minority" in Yates County (3.2%) and Census Tract 9901 (4.4%) are much lower than the minority percentages of the United States (30.9%) and the state of New York (38.0%). Therefore, the impacts of constructing and operating the proposed project would not be distributed disproportionately to a minority population.

The percentage of residents classified as "below poverty" in Yates County (13.1%) is also lower than that of the state of New York (14.6%), but slightly higher than that of the United States (12.4%). Also, the percentage of residents classified as below poverty in Census Tract 9901 (15.2%) is higher than that of Yates County, the state of New York, and the United States (Section 3.8.6). However, because the percentages below poverty for Census Tract 9901, Yates County, and the state of New York are all within 2.1 points, it does not appear that Census Tract 9901 constitutes a "poverty" population that would be disproportionately affected by the proposed project. Further, many of the potential impacts associated with the proposed project would be beneficial rather than adverse (e.g., an overall improvement in air quality).

4.1.10 Transportation and Noise

4.1.10.1 Transportation

Roads

The 100 to 150 direct workers expected during the peak construction period would access the project site using Lampman Road from State Highway 14. For this assessment, most of the construction workers were assumed to carpool to and from the project site each day (either from their homes or from hotels and motels), and the average vehicle was assumed to carry two workers (CONSOL 2004b). Thus, as an upper bound, about 150 additional vehicles trips (75 roundtrips to and from the site) would be generated each day by the construction workers.

As discussed in Section 3.9.1.1, ADT on the segment of Highway 14 near Greenidge Station was 2,595 vehicles in 2003, or about 10% of the highway's capacity. 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 5.8% increase over existing traffic. By itself, this small increase is not expected to create an appreciable impact on the overall level of service on Highway 14.

However, because the additional trips would occur at approximately the same time each morning and evening, there could be slight impacts to traffic flow and safety on Highway 14 and Lampman Road 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 and Lampman Road 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 and Lampman Road could also be affected by additional 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** (CONSOL 2004a). 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.

During demonstration of the proposed project, approximately three fewer truckloads of coal would be delivered to Greenidge Station each day (Section 2.1.6.3). This decrease in truck traffic would be offset by new truck traffic: three truckloads of lime that would be delivered each day and much less frequent deliveries of ammonia and powdered activated carbon (CONSOL 2004a). These new deliveries would have a negligible impact on traffic flow and safety on Highway 14 and Lampman Road.

Disposal of fly ash generated by the proposed project would increase the number of daily truck trips between Greenidge Station and the landfill from the current 6 trips to 9 trips. Because all travel would be on private roads, the increase would not affect local highway users.

Rail

Rail shipments to Greenidge Station would not increase during project construction because all construction equipment and materials would be delivered by truck (CONSOL 2004a). As discussed in Section 2.1.6.3, rail shipments during project demonstration would increase annually by about 2 trains of 100 rail cars each to offset about 850 loads of coal no longer delivered by truck (CONSOL 2004a). The impact of the increased train traffic would be negligible.

4.1.10.2 Noise

Noise levels are related to the magnitude of air pressure fluctuations that cause the eardrum to oscillate, thereby stimulating the auditory system. The magnitude of these pressure fluctuations is typically expressed as the Sound Pressure Level (SPL), which is measured in dB. By definition, the threshold of human hearing is 0 dB. Background levels at a recording studio are as low as 15 dB, conversational speech at the location of the listener is around 60–65 dB, and a jet takeoff is in the range of 120 dB at a distance of about 100 ft from the runway. The human threshold of pain, where the brain receives a signal to reduce the SPL or risk damage to the auditory system, begins at around 130 dB for most individuals. SPL is reduced by about 6 dB for each doubling of distance from an individual source.

Sound typically occurs over a wide spectrum of frequencies. For most applications, dB levels are determined by weighting the frequencies (i.e., some frequencies count more than others). The so-called “A weighting,” which was developed to approximate the way in which the human ear responds to the various frequencies, is typically expressed as dB(A).

EPA (1974) recommends a day-night level of 55 dB(A) or less to protect the public from activity interference and annoyance in typically quiet outdoor and residential areas. Day-night average sound level is defined as the 24 hour average sound level, in dB(A), obtained after the addition of 10 dB(A) to sound levels in the night from 10 p.m. to 7 a.m. Maintaining relatively continuous noise below this level also protects against hearing loss, although less stringent requirements are typically set for that purpose. From about 10:00 p.m. to 7:00 a.m., background noise is typically reduced due to the absence of the usual noise sources during daytime hours (e.g., vehicular traffic, lawn mowers, work activities, and recreational activities); consequently, noise at around 50 dB(A) becomes more noticeable and can be annoying. Therefore, 45 dB(A) is the level for potential activity interference and annoyance during the nighttime hours specified above.

During construction of the proposed project, the principal sources of noise would be from construction equipment and material handling. The amount and type of construction equipment would vary depending on the specific construction activity occurring at that time. Construction activity would primarily occur within 3 acres of the 153 acres occupied by Greenidge Station. The proposed project area is currently confined by the power plant building, the ramp from the upper parking lot, the short railroad bridge connecting the upper parking lot and the power plant building and the access road to the upper parking lot. The upper parking lot, which is about 30 ft above the main construction site, would be utilized as an equipment laydown area. An existing waste oil storage shed on this property would be relocated and the building torn down to make room for new equipment. The existing booster fan at the base of Unit 4 stack would be replaced by two larger units. The existing ESP would be replaced, and the new buildings [i.e., circulating dry scrubber (CDS) vessel, two ash recycling bins, lime storage silo, lime hydrator, powder activated carbon storage silo, ammonia (NH_3) storage tank system], and ancillary equipment would be erected on this land. The main construction, staging and fabrication areas would be expected to be located between existing structures and not located in proximity to sensitive noise receptors.

During construction, employees and contractors would be responsible for ensuring that exhaust mufflers and engine enclosures are in place and in good working order for all industrial trucks and other pieces of construction-related equipment. An exhaust muffler is a device that deadens the noise of escaping gases or vapors through which the exhaust gases of an internal-combustion engine are passed. An engine enclosure silences low frequency noise radiated from the engine. Exhaust mufflers and engine enclosures are commonly used, and are commercially available from many different manufacturers. All construction equipment would be properly maintained.

During operation of the proposed project, the principal interior sound sources would be the in-duct Selective Catalytic Reduction (SCR) unit, the hydrator, the circulating dry scrubber vessel, the carbon storage and injection system, and the electrostatic precipitator. Specifically, sound sources would include a water pump, hydrator feed system, air blowers, mechanical electrostatic precipitator rappers, two large booster fans, and various control valves. These sound sources would be enclosed and acoustically insulated. Noise sources within the buildings would be fitted with sound-attenuating enclosures or other noise dampening measures that would meet all state and federal regulations and AES’ noise standards. New equipment would operate at noise levels less than 85dB(A) at 3 ft from the base of the equipment (Scandrol 2004). During maintenance/repair events, workers would be required to wear hearing protection equipment.

There is no residential population within a quarter mile of the proposed project (Section 3.9.2). Due to planned noise attenuation measures, natural and man-made terrain features, and distance to the nearest residences, no perceptible change in noise associated with the proposed project would be expected. Therefore, the proposed project would be unlikely to increase noise levels perceptibly at the nearest residences or other offsite locations.

4.1.11 Electromagnetic Fields

Over the past two decades, some members of the scientific community and the public have expressed concern regarding human health effects from electromagnetic fields (EMF) during the transmission of electrical current from power plants. Despite efforts by the scientific community and research funding from governmental agencies and private organizations, the issue is still clouded with much uncertainty. The scientific evidence suggesting that EMF exposures pose any health risk is weak. The strongest evidence for health effects comes from associations observed in human populations with two forms of cancer, childhood leukemia and chronic lymphocytic leukemia in occupationally exposed adults (NIEHS 1999). EMF exposure cannot be recognized as entirely safe because of this evidence, even though the evidence does not clearly demonstrate a cause and effect relationship between EMFs and human health effects. Virtually everyone in the United States uses electricity and is exposed to EMFs; therefore, a continued emphasis on educating both the public and the regulated community on means aimed at reducing exposures is prudent.

For the proposed project, no additional sources of EMF such as new transmission lines would be required and, as a result, no perceptible changes to existing EMF levels would occur. Consequently, EMF-related health effects, if present, would be unchanged and small (NRC 1997).

4.1.12 Human Health and Safety

The proposed project would be subject to the OSHA General Industry Standards (29 CFR Part 1910) and the OSHA Construction Industry Standards (29 CFR Part 1926). During construction and operation of the proposed project, risks would be minimized by Greenidge Station’s adherence to procedures and policies required by OSHA, the state of New York, and AES. These standards establish practices, chemical and physical exposure limits, and equipment specifications to preserve employee health and safety.

Construction activities would comply with OSHA Construction Industry Standards (29 CFR Part 1926). Construction permits and safety inspections would be employed in an effort to minimize the frequency of accidents and further ensure worker safety. Construction equipment would be required to meet all applicable safety design and inspection requirements, and personal protective equipment would meet regulatory and consensus standards.

Potential health impacts to workers during construction of the proposed project would be limited to normal hazards associated with construction (i.e., no unusual situations would be anticipated that would make the proposed construction activities more hazardous than normal for a major industrial construction project). Most accidents in the construction industry result from overexertion, falls, or being struck by equipment

(NSC 2003). Construction-related illnesses would also be possible (e.g., exposure to chemical substances from spills).

Following construction of the proposed project, the total number of permanent employees needed to operate the facilities would not change (Section 2.1.4). To maximize worker safety, operations would be managed from a control room. All instruments and controls would be designed to ensure safe start-up, operation, and shut down. The control system would also monitor operating parameters and perform reporting functions. Control stations would be placed at remote locations at which operator attention would be required. Therefore, the overall design, layout, and operation of the facilities would minimize human hazards. Compliance with the Federal Occupational Safety and Health Standards, as well as safety standards specified by the state of New York and AES, would help maintain occupational safety at Greenidge Station. No substantial differences with respect to occupational safety or industrial hygiene would be expected between current operations and those of the proposed project. Thus, the occupational safety and health experience would not be expected to change as a result of the proposed operations.

Greenidge Station and AES would develop supplemental detailed procedures for inclusion in the plant's Occupational Safety and Health Program to assure compliance with OSHA and EPA regulations and serve as a guide for providing a safe and healthy environment for employees, contractors, visitors, and the community. These procedures would include job procedures describing proper and safe manners of working within the facilities, appropriate personal protective equipment (PPE) and hearing conservation protection devices (e.g., handling/storage of NH_3 would comply with CFR 1910.111 Hazardous Materials, Storage and handling of anhydrous ammonia; PPE would comply with CFR 1910.132, etc.). The manual would be used as a reference and training source and would include accident reporting and investigation procedures, emergency response procedures, gas rescue plan procedures, hazard communication program provisions, material safety data sheets, medical program requirements, and initial and refresher training requirements. In addition, supplemental provisions would be added to the plant's Contingency Plan for Hazardous Waste, Spill Prevention Control and Countermeasures Plan, Hazard Substances Response Procedures, and Air Pollution Emergency Episode Plan.

Potential health impacts to the public from the proposed project would include fugitive dust emissions typical of construction sites (Section 4.1.2.1) and operational combustion emissions from the proposed project (Section 4.1.2.2). Because ambient air quality standards are designed to protect public health with an adequate margin of safety (Section 3.2.2), continued attainment of air quality standards during construction and operation of the proposed project (Section 4.1.2) indicates that impacts to public health would be minimal.

4.2 POLLUTION PREVENTION MEASURES

Table 4.2.1 lists the pollution prevention measures that the project participants would provide during construction and operation of the proposed project. In addition, the project itself would demonstrate technologies to reduce air emissions. Specifically, the 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.

Table 4.2.1. Pollution prevention measures developed for the proposed project at Greenidge Station

Environmental Issue	Pollution prevention measure
Water quality	Follow standard engineering practices to prevent or minimize runoff, erosion, and sedimentation on and near the construction site (e.g., silt fences, berms, liners and cover materials as necessary).
	Ensure prompt containment and clean-up of accidental spills of construction materials such as solvents, paints, oil and grease, and hazardous substances in accordance with an appropriate spill, prevention, control, and countermeasure plan and best management practices plan.
Waste disposal	Investigate opportunities to reduce waste disposal requirements by finding beneficial uses for fly ash generated by the proposed project.
	Conduct leach testing of the fly ash prior to disposal to provide opportunities to modify the waste form to limit the potential release of contained Hg.
	Regenerate or recycle spent catalyst from the selective catalytic reduction (SCR) system, rather than transporting this material for disposal.
	Investigate the impact of process parameters on SCR catalyst life and adjust these parameters to minimize degradation of SCR catalyst, thus reducing the frequency of replacement or regeneration.
Noise	Ensure that all construction equipment (e.g., exhaust mufflers, engine enclosures, etc.) is in good working order, properly maintained, and lubricated.
	Use air inlet silencers on the project’s small blower units.
	Fit the ash handling system exhauster with an exhaust silencer (i.e., muffler) and operate the system intermittently.
	Equip delivery trucks with properly maintained mufflers.
	Acoustically insulate the structure enclosing the proposed ESP or baghouse and its associated equipment, as well as all doors, windows, and vent louvers.
Fugitive dust	Sprinkle exposed soils at the proposed project site with water during construction. Erosion of exposed surfaces and soil stockpiles would be limited through standard management practices.
	Lockwood Landfill operators have increased the wetting and compaction of fly ash and are implementing a new landfill operations plan designed to reduce wind exposure of active disposal areas.

4.3 ENVIRONMENTAL IMPACTS OF NO ACTION

Under the first scenario of the no-action alternative, in which AES would shut down Greenidge Station, environmental impacts for most resource areas would be less than for the proposed project. Resource requirements and discharges and wastes would cease. Because current environmental conditions at the site would tend to revert back to conditions prior to plant operation, existing impacts would be reduced. However, adverse socioeconomic impacts would be experienced because no construction activities would be undertaken, no employment would be provided for construction workers in the area (except for some limited activity associated with mothballing or dismantling the plant), and power plant workers would lose their jobs. In addition, at other power plants where electrical generation would increase to compensate for shutting down Greenidge Station (Section 2.2.1), impacts would tend to increase because the plants would tend to be older and generate greater quantities of air emissions, liquid discharges, and solid wastes.

Under this first scenario, disposal activity at the Lockwood Landfill probably would cease. Final cover would be applied, consistent with NYSDEC permitting requirements. The multilayer final cover would consist of a low-permeability synthetic membrane layer overlain by a permeable geosynthetic drainage layer and a protective soil layer at least 2 ft thick. Vegetation would be established over the cover. Site maintenance and monitoring would continue during a 30-year post-closure period. Landfill runoff and leachate would continue to be collected and discharged periodically to Keuka Outlet, as discussed in Section 4.1.7.2, until NYSDEC determined that the leachate no longer posed a threat to human health or the environment (Title 6, Official Compilation of Codes, Rules and Regulations of the State of New York, Subpart 360-2, Landfills).

Under the second scenario of the no-action alternative, in which AES would install commercially available pollution controls to comply with current and future emissions standards, operations would remain essentially the same as for the existing plant. Resource requirements and discharges and wastes would generally be the same as under current conditions, except that air emissions would be reduced because of the enhanced pollution controls and solid wastes would likely increase due to the captured air emissions. Additional solid wastes would likely be recycled or sold as a usable product. Construction activities associated with this scenario would be similar in scale to those of the proposed project. With the exception of improving air quality, there would be minimal change in current environmental conditions at the site and the impacts would remain very similar to existing conditions.

Under the third scenario, in which AES would switch to using natural gas rather than coal at Greenidge Station, disturbance beyond the Greenidge site would be greater than for the proposed project because of construction associated with a new 14-mile natural gas pipeline to deliver the fuel. Beneficial socioeconomic effects would likely result because construction activities would probably be at a slightly greater level than those associated with the proposed project. However, the potential cumulative impacts associated with the proposed project (i.e., availability and cost of tourist lodging facilities, effectiveness of wastewater treatment services, and flow and safety of traffic on State Highway 14) could be more substantial under this scenario. Resource requirements and discharges and wastes would generally be smaller than for the proposed project because of the type of fuel and because the converted facility would be more efficient than the existing plant due to a new gas-fired delivery system and other upgrades. Air emissions, particularly SO_2 emissions, would be considerably less than under current conditions because a new gas-fired delivery system would burn more efficiently and cleanly than an aging coal-fired power plant with limited emissions controls. As a beneficial impact, ash generation would be reduced or eliminated at the power plant, depending on whether Unit 4 alone or both units were switched. Current environmental conditions and impacts at the site would be expected to improve.

Under the fourth scenario, in which AES would purchase emissions allowances (e.g., SO_2, NO_x), the existing power plant would continue operating under current conditions. Resource requirements and discharges and wastes would be the same. Negligible change in current environmental conditions would be experienced at the site and the impacts would remain very similar to existing impacts. This scenario would not provide employment for construction workers in the area. The consumption of additional water from Seneca Lake by the proposed project would not occur. The potential cumulative impacts associated with the proposed project (i.e., availability and cost of tourist lodging facilities, effectiveness of wastewater treatment services, and flow and safety of traffic on State Highway 14) would not be experienced. The proposed project's potential benefits of reducing SO_2, NO_x, HCl, HF, SO_3, and Hg air emissions would not be realized. Consequently, the potential benefits of reduced air emissions to surface waters, wetlands, and ecological resources would not be realized.

5. IMPACTS OF COMMERCIAL OPERATION

At the end of the 12-month demonstration period of performance testing and monitoring, two scenarios are reasonably foreseeable: (1) a successful demonstration followed immediately by commercial operation of the project at the same power level using all of the new equipment from the demonstration; and (2) an unsuccessful demonstration followed by operation of Unit 4 at the same power level using the ESP or baghouse without the CDS, lime or carbon injection, or the SCR system.

Under the first scenario, the level of short-term impacts during commercial operation would not change from those described for the demonstration in Section 4 because the proposed project would continue as a baseload power plant operating 24 hours per day with the same operating characteristics. For long-term effects, the level of impacts would be nearly identical to those discussed in Section 4, except for impacts that accumulate with time (i.e., fly ash disposal).

If not beneficially reused, fly ash from the proposed project would be transported to the Lockwood Landfill for disposal (Section 4.1.7.2). By using the calculation in Section 4.1.7.2, an estimate is derived that the landfill could accommodate Greenidge Station wastes (including all of the waste from the proposed project) through 2040. Even with less optimistic assumptions about landfill capacity, it is apparent that the landfill site could accommodate fly ash from the proposed project until well beyond its 20-year commercial lifetime.

Catalysts used in the SCR process lose their reactivity over time and would need to be replaced or regenerated after about 3 years (Section 4.1.7.3). During the 3-year intervals, which would occur during commercial operation of the proposed project, it may be possible to regenerate the spent catalyst in situ, or it could be removed and returned to the manufacturer for treatment by one of several methods (Maier and Spokovny 2000). In the unlikely event that spent catalyst were discarded, it could become a hazardous waste because the active agent in the catalyst, vanadium pentoxide (V_2O_5), is classified as an acutely hazardous waste when discarded and is restricted from land disposal under both NYSDEC and federal regulations. Any spent catalyst discarded as a waste would need to be physically stabilized with cement or a similar material prior to disposal in a licensed hazardous waste landfill (40 CFR 268).

Hazardous waste landfills are available commercially to manage this waste. In 2001, a total of 32 licensed hazardous waste landfills or surface impoundments around the United States received waste from offsite sources (EPA undated). The one commercial hazardous waste land disposal facility in the state of New York is a landfill in Niagara County that handled 132,000 tons of waste in 2001. This landfill is projected to reach its licensed capacity by 2005 (NYSDEC 2003d). The NYSDEC expects that, if this facility closes, additional hazardous waste landfill capacity would be developed somewhere in the northeastern United States. However, licensed landfills in other parts of the country are estimated to have sufficient capacity for the volume of waste currently being landfilled at the Niagara County site (NYSDEC 2003d). Residues from catalyst regeneration might need to be managed as hazardous waste, but quantities would be smaller than if the entire catalyst volume were disposed.

Impacts associated with operations under the second scenario (an unsuccessful demonstration followed by operation of Unit 4 at the same power level using the ESP or baghouse without the CDS, lime or carbon injection, or the SCR system) would be similar to those during existing operations. Less fly ash would be captured by the ESP or baghouse than during the demonstration, due to the absence of lime and carbon injection. The amount of captured fly ash would probably be the same or slightly greater than under existing operations because the efficiency of the new ESP or baghouse would probably be slightly greater than the efficiency of the existing ESP serving Unit 4. Also, the characteristics of the fly ash under the second scenario would revert back to the characteristics of the fly ash currently generated by Greenidge Station. Air emissions would revert back to approach those under existing operations. The slightly more efficient ESP or baghouse might capture more particulate emissions. The small additional amount of water required during the demonstration would no longer be needed.

6. CUMULATIVE EFFECTS

This section discusses potential impacts resulting from other facilities, operations, and activities that in combination with potential impacts from the proposed project may contribute to cumulative impacts. Cumulative impacts are impacts on the environment that result from the incremental impact of the proposed project when added to other past, present, and reasonably foreseeable future actions regardless of the agency (federal or non-federal) or person that undertakes such other actions (40 CFR Part 1508.7). An inherent part of the cumulative effects analysis is the uncertainty surrounding actions that have not yet been fully developed. The Council on Environmental Quality (CEQ) regulations provide for the inclusion of uncertainties in the analysis, and state that "(w)hen an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking" (40 CFR Part 1502.22). The CEQ regulations do not say that the analysis cannot be performed if the information is lacking. Consequently, the analysis contained in this section includes what could be reasonably anticipated to occur given the uncertainty created by the lack of detailed investigations to support all cause and effect linkages that may result from the proposed project, and the indirect effects related to construction and long-term operation of the facility.

Because cumulative impacts accrue to resources, the analysis of impacts must focus on specific resources or impact areas as opposed to merely aggregating all of the actions occurring in and around the proposed facility and attempting to form some conclusions regarding the effects of the many unrelated actions. Narrowing the scope of the analysis to resources that would be expected to experience a reasonable likelihood of accrued foreseeable impacts supports the intent of the NEPA process, which is "to reduce paperwork and the accumulation of extraneous background data; and to emphasize real environmental issues and alternatives" [40 CFR Part 1500.2(b)]. Each resource analyzed has its own spatial (geographic) boundary, although the temporal boundaries (time frame) can generally be assumed to equal the life expectancy of the proposed project.

The proposed project would reduce SO_2, NO_x, HCl, HF, SO_3, and Hg air emissions, which would improve overall air quality and slightly decrease existing cumulative impacts in the region. Due to the reduction in emissions of SO_2, NO_x, HCl, HF, and SO_3, (which are associated with acid deposition) and Hg (which adversely affects humans and biota), the proposed project would slightly decrease existing cumulative impacts to surface waters, wetlands, and ecological resources at the local and, quite possibly, regional scales.

Project construction and operation would have slight socioeconomic impacts, and could contribute to cumulative impacts on the area's socioeconomic resources. The most noticeable of these cumulative impacts would likely result if the timing of the peak construction work force would coincide with the region's summer tourist season. These activities could conceivably combine to adversely affect the availability and cost of tourist lodging facilities, the effectiveness of wastewater treatment services, and the flow and safety of traffic on State Highway 14. However, such cumulative impacts, if they occur, would more likely be imperceptible and would be temporary, occurring during only a small portion of the 12-month construction period.

Because negligible or no impacts from the proposed project would be experienced by remaining resources, no cumulative impacts would be expected to these resources. Further, few new facilities, operations, or activities that could result in cumulative impacts are anticipated for the vicinity of Greenidge Station in the same time frame as the proposed project. The New York State Department of Transportation has no ongoing or planned road construction activities for State Highway 14 or for any other roads in Yates County (Bill Piatt, New York State Department of Transportation Region 6, personal communication to Bo Saulsbury, ORNL, February 11, 2004). The only ongoing or potential project known to the Yates County Industrial Development Agency is the possibility of an additional tourist lodging facility (Steve Isaacs, Yates County Industrial Development Agency, personal communication to Bo Saulsbury, ORNL, March 10, 2004).

7. REGULATORY COMPLIANCE AND PERMIT REQUIREMENTS

This section lists federal, state, and local regulatory compliance and permit requirements for the proposed project.

Under Section 7 of the Endangered Species Act of 1973 (Public Law 93-205, as amended), DOE must consult with the U.S. Fish and Wildlife Service to ensure that proposed actions are not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of the critical habitat of such species (Appendix A).

Under Section 106 of the National Historic Preservation Act (Public Law 89-665, as amended), DOE must consult with New York's State Historic Preservation Officer to ensure compliance with the act (Appendix B).

7.1 FEDERAL REQUIREMENTS

CLEAN AIR ACT (CAA)

- Enacted by Public Law 90-148, Air Quality Act of 1967 (42 USC 7401 et seq.)
- Amended by Public Law 101-549, Clean Air Act Amendments of 1990
- Comprised of Titles I through VI
- Applicable titles
  - —Title I—Air Pollution Prevention and Control. This Title is the basis for air quality and emission limitations, PSD permitting program, State Implementation Plans, New Source Performance Standards, and National Emissions Standards for Hazardous Air Pollutants. The PSD permitting program serves as the basis for PSD Construction Permits which are required by this Title of the Act.
  - —Title IV—Acid Deposition Control. This Title establishes limitations on sulfur dioxide and nitrogen oxide emissions, permitting requirements, monitoring programs, reporting and record keeping requirements, and compliance plans for emission sources. This Title requires that emissions of sulfur dioxide from utility sources be limited to the amounts of allowances held by the sources.
  - —Title V—Permitting. This Title provides the basis for the Operating Permit Program and establishes permit conditions, including monitoring and analysis, inspections, certification, and reporting.
- Regulations implementing the CAA are found in 40 CFR Parts 50–95.

FEDERAL WATER POLLUTION CONTROL ACT

- Enacted by Public Law 92-500 (33 USC 1251 et seq.)
- Amended by Public Law 95-217, Clean Water Act of 1977 (CWA) and Public Law 100-4, Water Quality Act of 1987
- Comprised of Titles I through IV
- Applicable titles
  - —Title III—Standards and Enforcement

Section 316—Thermal Discharges. Section 316 (a) addresses the permitting of thermal discharges that can allow alternative thermal effluent limitations that are less stringent than the limitations under Section 402(a) of the CWA. This section states that, if an owner of a discharge subject to Section 301 (Effluent Limitations) or Section 306 (National Standards of Performance) can demonstrate that an effluent limitation is ". . . more stringent than necessary to assure the protection and propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made. . .", then another effluent limitation may be imposed ". . .with respect to the thermal component of such discharge. . ."

Section 316 (b) addresses the permitting of water intake structures and requires that "Any standard established pursuant to Section 301 or Section 306 of this Act and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect best technology available for minimizing adverse environmental impact."

— Title IV—Permits and Licenses

Section 402, National Pollutant Discharge Elimination System (NPDES). This section regulates the discharge of pollutants to surface waters. Regulations implementing the NPDES program are found in 40 CFR Part 122.

Section 404, Permits for Dredged or Fill Material. This section regulates the discharge of dredged or fill material in the jurisdictional wetlands and waters of the United States. The COE has been delegated the responsibility for authorizing these actions.

- Regulations implementing the CWA are found in 40 CFR Parts 104–140. Regulations which affect the permitting of this project include
  - 40 CFR Part 112—Oil Pollution Prevention. This regulation requires the preparation of a Spill Prevention, Control, and Countermeasure Plan.
  - 40 CFR Part 122—NPDES. This regulation requires the permitting and monitoring of any discharges to waters of the United States.

EXECUTIVE ORDERS 11988 AND 11990

Executive Order 11988, Floodplain Management, directs federal agencies to establish procedures to ensure that they consider potential effects of flood hazards and floodplain management for any action undertaken. Agencies are to avoid impacts to floodplains to the extent practical. Executive Order 11990, Protection of Wetlands, requires federal agencies to avoid short- and long-term impacts to wetlands if a practical alternative exists. DOE regulation 10 CFR Part 1022 establishes procedures for compliance with these Executive Orders. Where no practical alternatives exist to development in floodplain and wetlands, DOE is required to prepare a floodplain and wetlands assessment discussing the effects on the floodplain and wetlands, and consideration of alternatives. In addition, these regulations require DOE to design or modify its actions to minimize potential damage in floodplains or harm to wetlands. DOE is also required to provide opportunity for public review of any plans or proposals for actions in floodplains (and new construction in wetlands).

The floodplain and wetlands effects anticipated from this proposed project are provided in the following sections of the EA: Section 3.5.1 (Floodplains—Existing Environment), Section 3.5.2 (Wetlands—Existing Environment), Section 4.1.5.1 (Floodplains— Environmental Consequences), and Section 4.1.5.2 (Wetlands—Environmental Consequences).

RESOURCE CONSERVATION AND RECOVERY ACT OF 1976

- Enacted by Public Law 94-580 (42 USC 6901 et seq.)
- Amended by Public Law 98-616, Hazardous and Solid Waste Amendments of 1984 and Public Law 99-499, Superfund Amendments and Reauthorization Act of 1986
- Applicable title
  —Title II—Solid Waste Disposal (known as the Solid Waste Disposal Act) regulates the disposal of solid wastes. Under Title II, Subtitle D—State or Regional Solid Waste Plans, allows each state to develop a comprehensive plan for managing and permitting the disposal of solid wastes.
- Project participants would be required to identify any residues that require management as hazardous waste under RCRA (40 CFR Part 261). For some waste streams, this includes testing waste samples using the TCLP or other procedures that measure hazardous waste characteristics.

ENDANGERED SPECIES ACT OF 1973

- Enacted by Public Law 93-205 (16 USC 1531 et seq.)
  —Section 7, "Interagency Cooperation," requires any federal agency authorizing, funding, or carrying out any action to ensure that the action is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species. Consequently, the U.S. Fish and Wildlife Service will conduct a consultation, in compliance with Subsection (a)(2) of Section 7 of the Act, with regard to the impacts of the proposed project on threatened and endangered species listed by the Service and any critical habitat of such species in the vicinity of the project.

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

- OSHA General Industry Standards (29 CFR Part 1910)
- Authority: Secs. 4, 6, 8, Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657); Secretary of Labor's Order Numbers 12-71 (36 FR 8754), 8-76 (41 FR 25059), 9-83 (48 FR 35736), 1-90 (55 FR 9033), or 6-96 (62 FR 111), as applicable.
- OSHA Construction Industry Standards (29 CFR Part 1926)
- Authority: 44 FR 8577, Feb. 9, 1979; 44 FR 20940, Apr. 6, 1979

7.2 STATE REQUIREMENTS

- Title V Facility Permit and Modified Title IV Facility Permit 8-5736-00004/00013 and 8-5736-00004/00014, New York State Department of Environmental Conservation

- State Pollutant Discharge Elimination System Permit 8-5736-00004/00001, New York State Department of Environmental Conservation
- Facilities used for disposal of solid waste must be licensed by the New York State Department of Environmental Conservation. Construction and operation of these facilities must conform with requirements established as a condition of licensing. Disposal of fly ash would be in Lockwood Landfill.

8. IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

For the proposed project, some of the resource commitments would be irreversible and irretrievable; that is, the resources would be neither renewable nor recoverable for future use. Resources that would be irreversibly or irretrievably committed by construction and demonstration of the proposed project include construction materials that could not be recovered or recycled and fuel and sorbent consumed or reduced to unrecoverable forms of waste.

Resources used during construction of the proposed project would include crushed stone, sand, water, diesel fuel, gasoline, and iron ore used to produce steel. Resources used during the demonstration would include coal, No. 2 fuel oil, lime, ammonia, powdered activated carbon, and water. None of these resources is in short supply relative to the size and location of the proposed project.

The proposed project requires a commitment of human and financial resources that could threaten or jeopardize the use of these resources for alternative projects or federal activities. However, the commitment is consistent with the purpose and need for the proposed project (Section 1).

9. THE RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

The proposed project would occupy about 3 acres of the Greenidge Station site and consume resources (either individually or as part of the power plant) including coal, No. 2 fuel oil, lime, ammonia, powdered activated carbon, and water. The proposed project (either individually or as part of the power plant) would generate liquid effluents and solid wastes (unless all of the fly ash were sold). Except for NH_3 emissions, air emissions would be unaffected or reduced.

The long-term benefit of the proposed project would be to demonstrate environmentally sound and innovative technologies for the utilization of coal. The 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 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.

The design size for the proposed project was selected to establish performance results at a scale that would convince utilities that the integrated technologies, once demonstrated at this scale, could be commercialized using similar sized or larger applications without further scale-up to verify operational or economic performance. Therefore, although the proposed project would consume resources and generate effluents and solid wastes, the project would demonstrate integrated technologies that, once commercialized, would generally reduce air emissions both domestically and abroad compared with conventional coal technologies.

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