CHAPTER 1

1. PURPOSE, NEED, BACKGROUND, AND SCOPING

1.1. Purpose and Need for the Proposed Action

The purpose of the proposed project is to reduce sulfur dioxide (SO_2) emissions from Unit 3 at Paradise Fossil Plant (PAF) by installing flue gas desulfurization (FGD) equipment that employs the wet limestone forced oxidation (LSFO) technology. The Tennessee Valley Authority (TVA) needs to reduce SO_2 emissions at PAF to meet requirements under the 1990 Clean Air Act amendments.

1.2. Background

In TVA's continuing efforts to improve air quality in the Tennessee Valley and to comply with the Clean Air Act, TVA plans to design, build, and operate five FGD systems to reduce SO_2 emissions from TVA's coal-fired power plants. In addition to the installation on Unit 3 at PAF, TVA plans to install this equipment at Bull Run Fossil Plant (BRF), which has one unit, and control emissions from all units at Kingston Fossil Plant (KIF) in Tennessee (all units can be controlled by two systems) and at Colbert Fossil Plant (COF) in Alabama. These five FGD systems will cost approximately $1.5 billion and will collectively reduce emissions of SO_2 by more than 200,000 tons per year, bringing TVA's total emissions down by 85 percent since 1977. The locations of the systems have been chosen to provide the greatest environmental benefit for the investment in dollars and to improve air quality regionally.

PAF Unit 3 will be the first unit to receive an FGD system since the retrofit of Units 1 and 2 at Cumberland Fossil Plant in 1995. This Environmental Assessment (EA) describes the impacts of constructing and operating a wet limestone scrubber at PAF, which is the type of FGD system now operated on PAF Units 1 and 2. The selection of wet limestone scrubbing for application at PAF results in compatibility with existing operating and maintenance systems at the plant and means no new types of byproducts or wastes would be introduced at the site. The dates and order of the FGD systems on the other plants will be determined through engineering studies that will be completed over the next several months. As pollution control technology improves in the future, TVA may shift to other technology. In any event, environmental reviews will be prepared for the FGD projects at the other three plants mentioned above as engineering design and technology information for those plants becomes sufficiently detailed to support an accurate and complete environmental review.

SO_2 Control Technologies

Sulfur is present in coal as an impurity and reacts with oxygen to form SO_2 when the coal is burned to generate electricity. Reduction of SO_2 emissions has typically been achieved through one or a combination of the following:

- Use of fuel desulfurization methods
- Switching to lower-sulfur fuels
- Use of FGD systems

TVA utilizes all of these techniques in meeting regulatory requirements at its 11 coal-fired plants. Each of these options has its own costs and benefits; however, there is no single universal solution. The current strategy for maintaining compliance at PAF employs all three methods. Fuel desulfurization occurs through the washing of coal before it is burned. Coal washing is effective in reducing pyrite content (small, discrete iron sulfide particles in the coal), but is not effective for removing the organic sulfur from the coal matrix. Organic sulfur accounts for 35 to 75 percent of the total sulfur content in Illinois Basin coals, which are burned at PAF. The use of lower-sulfur coal was initiated at PAF Unit 3 in 1981-82, resulting in a drop in SO_2 emissions from about 7.5 pounds/millions of British thermal units (lb/MBtu) to about 4.5 lb/MBtu. FGD, namely wet LSFO scrubbing, has been used to reduce SO_2 emissions from PAF Units 1 and 2 since 1982. From 1982 to 1984, SO_2 emissions from these units dropped from about 7.5 lb/MBtu to slightly over 0.5 lb/MBtu.

As noted in the introduction to this section, the technology identification for PAF Unit 3 was dictated by the fact that Units 1 and 2 are currently scrubbed with an LSFO system to remove SO_2. However, since no scrubbing is performed at the other plants being considered for this project, compatibility with existing scrubbing systems would not be a factor at those other plants. The selection of the FGD technology to employ at the remaining three plants will be based on TVA performance needs, compatibility with existing facilities at each plant, costs and availability of fuels, and maintenance procedures. TVA will additionally require that the technology be commercially available and fully demonstrated on utility coal-fired plants larger than 100 megawatts (MW) and that burn medium- to high-sulfur coal (greater than [>] 3 lb/MBtu).

Paradise Fossil Plant

PAF is located in Muhlenberg County in western Kentucky approximately 35 miles northwest of Bowling Green and 95 miles southwest of Louisville. The plant is located on the south bank of the Green River at river mile 100.2 (upstream from the Green River's confluence with the Ohio River) and 8 miles downstream of the United States Army Corps of Engineers' (USACE) Lock and Dam No. 3, also on the Green River. The plant is located northeast of Drakesboro. A 2.2-mile-long railroad to the plant provides access from a spur of the CSX Railroad.

The plant is on a large reservation of approximately 3,000 acres. Most nearby land adjoining the plant property is reclaimed coal mining land. There are no residences within 3 to 4 miles of the plant on the west side (plant side) of the Green River, with the town of Drakesboro being the nearest community. On the east side of the Green River opposite the plant, the nearest residences are at a distance of approximately 2 miles.

PAF was the eighth large-capacity, coal-fired, steam-electric plant built by TVA. Construction began in November 1959. The initial plant was operational in 1963 and had two generating units with a rated capacity of 704 MW each. At the time, these were the largest operating units in the world. A third unit was added in 1970 with a rated capacity of 1,150 MW. Currently, PAF produces over 7 million megawatt hours (MWh) of electricity per year.

Each of the PAF boilers is of a cyclone design. PAF uses high-sulfur eastern coals primarily from nearby counties in western Kentucky and southern Illinois in Units 1 and 2. Unit 3 burns various blends of western Kentucky, Powder River Basin, and Utah bituminous coals. Coal is transported to the plant by truck, rail, and barge. In addition to its major role as a power producer for the region, PAF has demonstrated state-of-the-art pollution control

technology. To reduce sulfur and ash content of the fuel, coal washing began in 1981 and as described above, wet limestone scrubbers were added to Units 1 and 2 in 1983. Electrostatic precipitators (ESPs) were installed on all three units to remove fly ash. However, ESPs are no longer operated on Units 1 and 2; particulate matter (PM) is controlled by the scrubbers. Most recently, TVA has installed selective catalytic reduction (SCR) equipment to reduce emissions of nitrogen oxides (NO_x) by approximately 90 percent from PAF. In all (excluding the currently proposed scrubber), TVA has spent $ 454 million since 1979 for modern pollution control equipment at PAF to accomplish a 70 percent reduction in SO_2 emissions.

1.3. The Scoping Process

A TVA interdisciplinary team reviewed the potential direct, indirect, and cumulative effects of the proposed use of LSFO technology at PAF for SO_2 reduction. From this review, the following project aspects identified for detailed analyses could potentially result in impacts:

- Beneficial effects to air quality from reducing SO_2 emissions
- Disposal of gypsum byproduct (solid waste)
- Wastewater and discharges to surface waters
- Transport of additional limestone to PAF
- Noise from additional limestone unloading and handling facility and other ancillary equipment
- Socioeconomic effects of the project related to increased jobs

1.4. Related National Environmental Policy Act (NEPA) Documents

Environmental Assessment - Paradise Fossil Plant Purchase and Development of Land for Disposal of Coal Wash Fines and Miscellaneous Dredge Materials (TVA, 1986)

Environmental Assessment - Development of Dredged Ash Disposal Area Paradise Fossil Plant (TVA, 1989)

Energy Vision 2020 – Integrated Resource Plan Environmental Impact Statement (TVA, 1995)

Environmental Assessment - Development of Ash Disposal Capacity at Paradise Fossil Plant (TVA, 1996)

Environmental Assessment - Paradise Fossil Plant Units 1, 2, and 3 Selective Catalytic Reduction Systems for Nitrogen Oxide Control (TVA, 1999)

1.5. Public and Agency Involvement

In December 2002, the Draft EA was placed on the TVA Web site; Public Notice was published in the Bowling Green, Kentucky, newspaper; and a more widespread news release was made regarding availability of the EA. This release informed interested persons that copies of the EA were available by request from TVA staff in Environmental

Policy and Planning, Knoxville, Tennessee. Copies of the EA were also made available in public libraries in Bowling Green, Drakesboro, and Louisville, Kentucky; Nashville, Tennessee; and the main TVA Corporate Library in downtown Knoxville, Tennessee.

In December 2002, copies of the draft EA were mailed to the Kentucky Department for Environmental Protection, the Kentucky Heritage Council, the National Park Service, the USACE, and the United States Fish and Wildlife Service. No comment or correspondence was received from agencies or the public during the 30-day comment period.