DOE/EA-1616

CARBON RESEARCH CENTER PROJECT AT SOUTHERN COMPANY SERVICES' POWER SYSTEMS DEVELOPMENT FACILITY NEAR WILSONVILLE, ALABAMA

FINAL ENVIRONMENTAL ASSESSMENT

U.S. DEPARTMENT OF ENERGY
Office of Fossil Energy
National Energy Technology Laboratory

SEPTEMBER 2008

COVER SHEET

Responsible Agency: U.S. Department of Energy

Title: Carbon Research Center Project, Draft Environmental Assessment (DOE/EA-1616)

Location: Southern Company Services' Power Systems Development Facility near Wilsonville, Alabama

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Abstract:

The United States Department of Energy, National Energy Technology Laboratory (DOE NETL) prepared this Environmental Assessment (EA) to analyze the potential environmental impacts of providing funding for the proposed Carbon Research Center (CRC) project to be located at the existing Power Systems Development Facility (PSDF) near Wilsonville, Alabama. The PSDF is owned and operated by Southern Company Services, Inc., a subsidiary of Southern Company an electric generation and transmission holding company.

The CRC would be designed to test and evaluate carbon dioxide (CO_2) control technologies for power generation facilities, including CO_2 capture solvents, mass-transfer devices, lower cost water-gas shift reactors, scaled-up membrane technologies, and improved means of compressing CO_2. Additionally, the CRC would evaluate methods to integrate CO_2 capture technologies with other coal-based power plant systems by testing both pre-combustion and post-combustion technologies. The CRC would provide the capability to test these systems

under a wide range of fuels, including bituminous and sub-bituminous coals, lignites and biomass/coal mixtures. The goal of the CRC project is to accelerate the development, optimization, and commercialization of viable CO_2 control technologies.

The proposed action currently being evaluated is for DOE to provide, through a 60-month cooperative agreement with Southern Company Services, Inc., financial assistance for the proposed development of the CRC Project at the PSDF plant. If approved, DOE would provide project assistance to test components and advanced power systems, including carbon (in the form of CO_2) capture technology, under realistic conditions using coal-derived gas streams. A small component of the CRC project would be located adjacent to the E.C. Gaston Electric Generating Plant.

No major modifications to existing operational permits for the PSDF are anticipated to be required as a result of the implementation of the proposed action; however, some minor modifications may be needed. No previously undisturbed ground would be developed and no significant adverse impacts are anticipated to result from implementation of the action. The project would primarily involve the installation of new components on existing facilities in order to research and develop carbon capture technologies, and, the continued operation of the PSDF facility for a period of 5 years.

Public Participation:

DOE encourages public participation in the NEPA process. Comments were invited on the Draft EA for this project for a period of 30 days after publication of the Notice of Availability (NOA) in two local newspapers; The Birmingham News and the Shelby County Reporter (see Appendix C). The NOA was published for 3 consecutive days and 1 week, respectively, beginning July 27, 2008. Copies of the Draft EA were available through the Harrison Regional Library System at select locations chosen by the regional library director and at the PSDF facility. The public was encouraged to submit written comments regarding the proposed project to DOE by the close of the comment period on August 27, 2008. As of September 5, 2008, no comments on the Draft EA were received and the EA was finalized.

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AAC	Alabama Administrative Code
ADEM	Alabama Department of Environmental Management
AQCR	Air Quality Control Region
AQCR 004	Metropolitan Birmingham Intrastate AQCR
BACT	Best Available Control Technology
BMP	Best Management Practice
BOD	Biochemical Oxygen Demand
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, Liability Act
CFR	Code of Federal Regulations
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CRC	Carbon Research Center
CWA	Clean Water Act
DBU	Declaration of Beneficial Use
DHS	Department of Homeland Security
DOE	U.S. Department of Energy
EA	Environmental Assessment
EIA	Energy Information Administration
EO	Executive Order
EPRI	Electric Power Research Institute
ESA	Endangered Species Act
ESP	Electrostatic Precipitator
FGD	Flue Gas Desulfurization
FONSI	Finding of No Significant Impact
FY	Fiscal Year
GCR	General Conformity Rules
GHG	Greenhouse Gas
gpd	gallons per day
ha	Hectare
HAPS	Hazardous Air Pollutants
HAZMAT	Hazardous Material
HFCs	Hydrofluorocarbons
ID	Induced Draft
IGCC	Integrated Gasification Combined Cycle
kV	Kilovolts
KVA	Kilovolt-Amperes or Kilovolt-Amps
MACT	Maximum Achievable Control Technology
MGD	million gallons per day
msl	mean sea level
MSW	Municipal Solid Waste
MW	Megawatt

NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NETL	National Energy Technology Laboratory
NHPA	National Historic Preservation Act
NNSR	Nonattainment New Source Review
N_2O	Nitrous Oxide
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxides
NOA	Notice of Availability
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NSPS	New Source Performance Standards
NSR	New Source Review
O_3	Ozone
OSHA	Occupational Safety and Health Administration
PFCs	Perfluorocarbons
PM	Particulate Matter
PM_{10}	Particulate Matter < 10 microns in diameter
$PM_{2.5}$	Particulate Matter < 2.5 microns in diameter
POL	Petroleum, Oils and Lubricants
PPA	Pollution Prevention Act
pph	pounds per hour
ppm	parts per million
PSD	Prevention of Significant Deterioration
PSDF	Power Systems Development Facility
RCRA	Resource Conservation Recovery Act
R&D	Research and Development
sf	square foot
SF_6	Sulfur Hexafluoride
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SPCC	Spill Prevention Control and Countermeasures Plan
SWPPP	Storm Water Pollution Prevention Plan
TMDL	Total Maximum Daily Load
tpy	tons per year
µm	micrometer
$\mu g/m^3$	micrograms per meter cubed
UNFCC	United Nations Framework Convention on Climate Change
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compound

1.0 INTRODUCTION

The United States Department of Energy, National Energy Technology Laboratory (DOE NETL) prepared this Environmental Assessment (EA) to analyze the potential environmental impacts of providing funding for the proposed Carbon Research Center (CRC) project to be located at the existing Power Systems Development Facility (PSDF) near Wilsonville, Alabama. The PSDF is operated by Southern Company Services, Inc., a wholly-owned subsidiary of Southern Company, an electric generation and transmission company.

The CRC would be designed to test and evaluate Carbon Dioxide (CO_2) control technologies for power generation facilities, including CO_2 capture solvents, mass-transfer devices, lower cost water-gas shift reactors, scaled-up membrane technologies, and improved means of compressing CO_2. Additionally, the CRC would evaluate means to integrate CO_2 capture technologies with other coal-based power plant systems by testing both pre-combustion and post-combustion technologies. The CRC would provide the capability to test these systems under a wide range of fuels, including bituminous, sub-bituminous coals, lignites and biomass/coal mixtures. The goal of the CRC project is to accelerate the development, optimization, and commercialization of viable CO_2 control technologies.

1.1 BACKGROUND

The PSDF is located on 16.6 acres of land, located 1.5 miles northeast of the town of Wilsonville in Shelby County, Alabama. The PSDF property is located within a utility plant site, Alabama Power Company's E.C. Gaston Generating Plant (Plant Gaston).

The PSDF is a facility designed and built to evaluate advanced coal-based power technologies at a scale large enough to provide meaningful data for scale-up and under conditions that adequately represent temperature, pressure, and contaminant conditions of a commercial embodiment. The PSDF is operated by Southern Company as a unique Research and Development (R&D) test facility under partial funding from DOE, on behalf of several industrial partners such as Electric Power Research Institute (EPRI), KBR, Inc., Lignite Energy Council, and Peabody Energy. The PSDF project was initiated September 14, 1990. Upon completion of construction and commissioning, the first coal-fired operations began in August 1996. The current funded Cooperative Agreement is currently set to expire on September 30, 2008. However, research and development efforts at the PSDF, in the form of the CRC, are proposed for another 5-year period.

The initial EA for the development, construction, and operation of the PSDF was issued with a Finding of No Significant Impact (FONSI) in 1993. The proposed action currently being evaluated is for DOE to provide, through a 60-month cooperative agreement with Southern Company Services, Inc., 80% of the cost share (an estimated total of $201,163,318) for the proposed development of the CRC Project at the PSDF plant. If approved, DOE would provide project assistance to test components and advanced power systems, including carbon (in the form of CO_2) capture technology, under realistic conditions using coal-derived gas streams. A small component of the CRC project would be located at the adjacent E.C. Gaston Generating Plant (**see Figures 1-1 and 1-2**).

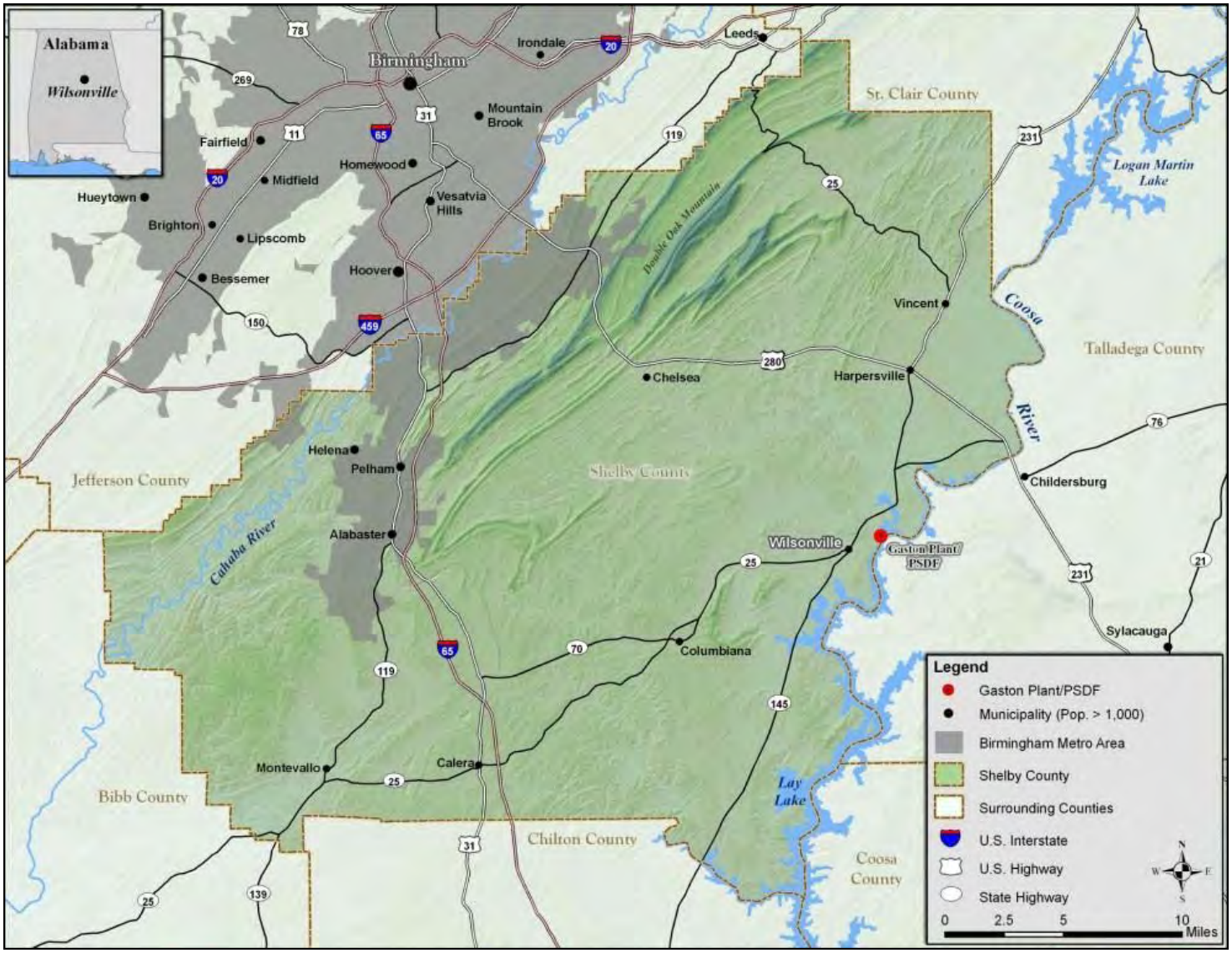

Figure 1-1. Project Vicinity Map

Figure 1-2. PSDF/Plant Gaston Site Map

No major modifications to existing operational permits for the PSDF are anticipated to be required as a result of the implementation of the proposed action. No previously undisturbed ground would be developed. The project would primarily involve the continued operation of the PSDF facility for a period of 5 years, while new components and carbon capture technologies are installed, tested, and further developed.

1.2 PURPOSE AND NEED

The proposed agency action, providing funding to help establish the CRC at the PSDF near Wilsonville, Alabama, serves the purpose of accelerating the development, optimization, and commercialization of viable CO_2 control technologies for coal-based power generation facilities. The proposed action would continue R&D activities at the PSDF for a period of 5 years.

The need for the project is for DOE NETL to carry out research, development, and demonstration programs to resolve the environmental, supply, and reliability constraints of producing and using fossil resources, and, to develop efficient and effective CO_2 capture systems, which is one of the fundamental goals of NETL's Carbon Sequestration Program (DOE, 2008; DOE, 2007).

NETL is a DOE national laboratory which devotes the majority of its funding to R&D partnerships with industry, university, and other government entities. NETL is committed to addressing the challenges put forth by the National Energy Policy, which include enhancing America's energy security; improving the environmental acceptability of energy production and use; increasing the competitiveness and reliability of U.S. energy systems; and ensuring a robust U.S. energy future (DOE, 2008).

The demand for electric power in the U.S. and around the world shows continued, steady growth. According to DOE's Energy Information Administration (EIA) Annual Energy Outlook, the coal share of total electricity generation in the U.S. remains between 48 percent and 49 percent from 2006 through 2018 before increasing to 54 percent in 2030 (EIA, 2008). Both the U.S. and world economies are linked to an abundant, reliable and cost-effective supply of electricity. While efforts are being expanded to manage the pace of electricity demand growth by energy efficiency and conservation programs, it is clear that new sources of electricity generation will be needed. While nuclear, natural gas and renewable sources of generation will be utilized going forward, the size of the U.S. demand for low-cost electricity will mandate continued and expanded use of domestic coal-based power generation.

Of concern to many, however, about the use of coal is its environmental impact, including the amount of carbon dioxide, CO_2, emitted per unit of power generation. Many link CO_2 emissions to concerns over global climate change. Because of the growing concentration of CO_2 in the atmosphere, there is a growing sense of urgency to legislate restrictions on the emissions of CO_2. However, cost-effective technologies to enable coal use with reduced emissions of CO_2 are not commercially viable or available. To keep coal in the U.S. generation mix, significant advancements in CO_2 capture

technologies from coal-based power generation are needed. The proposed action aims to develop cost-effective CO_2 capture technologies that are integrated with coal-based electricity generation and to demonstrate reliable operations of the integrated system.

1.3 SCOPE OF THE EA

This DOE EA analyzes the environmental impacts that would result from the Proposed Action and the No Action alternative. This EA was prepared in compliance with the National Environmental Policy Act of 1969 (P.L. 91-190), the Council of Environmental Quality Regulations dated 28 November 1978 (40 CFR Parts 1500-1508), and the DOE NEPA Implementing Procedures (10 CFR Part 1021).

Key goals of NEPA are to help Federal agency officials make well-informed decisions about agency actions and to provide a role for the general public in the decision-making process. The study and documentation mechanisms associated with NEPA seek to provide decision-makers with sound knowledge of the comparative environmental consequences of the several courses of action available to them. NEPA studies, and the documents recording their results, such as this EA, focus on providing input to the particular decisions faced by the relevant officials.

This EA identifies, describes, and evaluates the potential environmental impacts that would result from the implementation of the proposed action and the no action alternative, taking into consideration possible cumulative impacts from other actions. As appropriate, the affected environment and environmental consequences of the action will be described in both site-specific and regional contexts. In instances where mitigation measures may lessen any potentially adverse impacts, this EA identifies such measures that should be implemented to further minimize environmental impacts.

The following resource areas have been identified for study within this EA: soil and geology, water resources (including groundwater, wetlands, and floodplains), air quality, biological resources (including threatened and endangered species), waste and hazardous materials management, human health and safety, cultural resources, and socioeconomics. Resource areas considered but dismissed for further analysis are discussed below.

1.3.1 Resource Topics Dismissed from Further Analysis

Several resource topics and issues were raised during internal DOE scoping for this project that were not considered to warrant detailed analysis in this EA because they were: 1) outside the scope of the Proposed Action; 2) already decided by law, regulation, or other higher level decisions; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The rationale for eliminating these issues is provided in the descriptions below.

Wild and Scenic Rivers

The National Wild and Scenic Rivers Act is administered by four federal agencies; the Bureau of Land Management, the National Park Service, the U.S. Fish and Wildlife Service, and the U.S. Forest Service. The Act protects selected rivers, and their immediate environments, which possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural or other similar values. In the State of Alabama, there is only one National Wild and Scenic River, the Sipsey Fork of the Black Warrior River. The Black Warrior River is a tributary of the Tombigbee River in west central Alabama.

The Sipsey Fork of the Black Warrior River originates at the confluence of Thompson and Hubbard creeks in southwestern Lawrence County. The Sipsey Fork flows in a south southeasterly direction until impacted by the impounded waters of Lewis-Smith Reservoir. The section of the tributary which is a designated wild and scenic river lies completely within the boundaries of the William B. Bankhead National Forest, approximately 50 miles northwest of Birmingham (ADCNR, 2008). The Sipsey Fork of the Black Warrior River and its watershed will not be affected by the proposed project in any way. Therefore, this topic is dismissed from further analysis.

Land Use

The PSDF occupies just over 16 acres of land within the Plant Gaston utility site. The land surrounding the site is primarily rural, with a few scattered residences within a half mile of the site line near Highway 25. The predominant land use in the vicinity of the property is forest and agricultural (timber, peach, and cotton production), although there are several industries located within the county. About 2.2 acres of the site are within the city limits of Wilsonville.

Six acres of the PSDF are currently used for the process test facility and support structures; 3 acres are used for the covered coal and limestone storage piles and the sedimentation basin; and the remaining acres are used for parking lots, office space, a warehouse, and laydown areas. The Proposed Action would involve the installation of two concrete pads (one is estimated to measure 20’ x 40’, and the other is estimated to measure 30’ x 15’) within the process test facility and support structure area of the PSDF site. Project activities at Plant Gaston would take place entirely within the plant site, and would consist of the installation of new foundations on an approximately 50’ x 150’ area and the utilization of an additional 50’ x 50’ area for infrastructure and support systems.

The Proposed Action consists of a relatively small footprint of new site development at previously disturbed areas, which are already designated and actively used for industrial operations. No onsite land use changes would result from implementation of the Proposed Action. Additionally, no changes to vicinity land use or land use designations would occur. Therefore, this topic is dismissed from further analysis.

If the PSDF is at any point slated for decommissioning, it is expected that a Decontamination, Demolition, and Disposal (DD&D) Plan with a detailed description of the proposed decontamination, demolition, and disposal of both the pre-combustion and post-combustion facility, and, determinations of future land uses of the property will be developed in concert with NETL participation and approval. However, facility decommissioning and possible future land use are not within the scope of this EA.

Traffic and Transportation

Alabama Highway 25 provides principle access to the PSDF and Plant Gaston site, and the PSDF shares an existing access road off of Highway 25 to Plant Gaston. Additionally, a railroad which services Plant Gaston bisects the property. Under the Proposed Action, the PSDF and Plant Gaston are anticipated to receive the same amount of traffic as they are currently experiencing. No additional impacts to either traffic or transportation are anticipated to result. Therefore, this impact topic is dismissed from further analysis.

Noise

Noise is generally defined as unwanted sound. Noise can influence humans or wildlife by interfering with normal activities or diminishing the quality of the environment. Noise levels heard by humans are dependent on several variables, including distance, ground cover, and objects or barriers between the source and the receiver, as well as atmospheric conditions. Certain land uses, facilities, and the people associated with these noise levels are more sensitive to a given level of noise than other uses. Such "sensitive receptors" include schools, churches, hospitals, retirement homes, campgrounds, wilderness areas, hiking trails, and some species of threatened or endangered wildlife. The closest sensitive receptor to the project site is the Wilsonville Elementary School, located approximately 2 miles southwest of the site.

Neither construction nor operation activities associated with the Proposed Action are anticipated to be audible offsite of the Plant Gaston property. Noise associated with the proposed CRC would contribute only an incremental amount to the cumulative noise generated from Plant Gaston. Onsite impacts of noise during construction should be minimized by limiting construction activity to primarily daylight business hours and by using properly maintained and muffled equipment. Hearing protection equipment would be required for workers when sound levels that exceed Federal workplace standards. Provided the preceding steps are taken, no impacts from noise are anticipated from the proposed project, and this topic is therefore dismissed from further analysis.

Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations,* requires all federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. Although the nearest residential areas to the PSDF include some levels of both low-

income and high-minority populations, these levels are not disproportionately high and the Proposed Action is not anticipated to impact these areas in any event due to the distance of the proposed facilities, the high dispersion rate of air emissions in the area, and the low level of changes to the socioeconomic environment of the area anticipated from this project. Therefore, this topic is dismissed from further analysis.

Recreation

The project area is contained entirely within a secured utility plant site; there is no public access to, or use of, the natural resources located on site. The closest designated outdoor recreation area, the Talladega National Forest, is located over 30 miles east of the site.

The Proposed Action would not result in any impacts to public or recreational uses of the land. Furthermore, the offsite impacts of the Proposed Action (e.g. surface water withdrawals and discharges, and air emissions from facilities operations) are not anticipated to have any impact on recreation activities offsite of the proposed project area. Because the proposed project would not appreciably diminish recreation opportunities or the quality of recreation activities in the vicinity of the project area, this topic is dismissed from further analysis.

1.3.2 Compliance with Laws and Executive Orders

This project complies with the NEPA, CEQ regulations (40 CFR Parts 1500-1508), and DOE regulations for compliance with NEPA (10 CFR Part 1021). The EA also addresses all applicable laws and regulations, including but not limited to the following:

- National Historic Preservation Act (NHPA),
- Archeological Resources Protection Act (ARPA),
- The Noise Control Act of 1972, as amended,
- Addressing Environmental Justice (EO 12898)
- Clean Air Act (CAA),
- Clean Water Act (CWA),
- Coastal Zone Management Act,
- Protection of Wetlands (EO 11990),
- Floodplain Management (EO 11988),
- Endangered Species Act (ESA),
- Pollution Prevention Act (PPA),
- Resource Conservation and Recovery Act (RCRA), and
- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

Implementation of the Proposed Action will help the DOE meet the goals and challenges put forth by the National Energy Policy, enacted by the Energy Policy Act, as amended.

2.0 PROPOSED ACTION AND ALTERNATIVE ACTIONS

2.1 ALTERNATIVE 1: PROPOSED ACTION – IMPLEMENTATION OF THE CARBON RESEARCH CENTER AT PSDF

The Proposed Action, providing funding for the implementation and operation of the Carbon Research Center (CRC) at the PSDF, is consistent with DOE's goal to reduce CO_2 emissions from coal-fueled power plants. The CRC would be designed to test and evaluate CO_2 control technologies, including CO_2 capture solvents, mass-transfer devices, lower cost water-gas shift reactors, scaled-up membrane technologies, and improved means of compressing CO_2. The CRC would also evaluate means to integrate CO_2 capture technologies with other coal-based power plant systems by testing both pre-combustion and post-combustion technologies. The CRC would provide the capability to test these systems under a wide range of fuels, including bituminous and sub-bituminous coals, lignites and biomass/coal mixtures. The goal of the CRC project is to accelerate the development, optimization, and commercialization of CO_2 control technologies.

The DOE funding provided would be 80% of total project cost, or $201,163,318 of the projected total 5 year project cost of $251,454,148. Southern Company and its industry partners, primarily EPRI, KBR, Inc., Lignite Energy Council, Luminant, and Arch Coal, Inc., would provide the remaining 20% project cost.

Background

The Proposed Action is consistent with the objectives of DOE and NETL to provide lower cost, reliable electricity while decreasing environmental emissions, including carbon dioxide, from coal-fired power generating plants. Coal, a readily available domestic fuel, currently accounts for approximately half of the electricity generated in the United States, and is projected by most analyses to remain the backbone of U.S. electricity supply through 2050 and beyond. However, sustaining coal as a viable option in light of possible future restrictions on carbon emissions entails increasing the efficiency and reducing the capital cost of coal utilization, and bringing CO_2 carbon capture and storage to the point of cost-effective commercialization. By establishing the CRC at the PSDF and increasing efforts to make the facility available for third-party test and evaluation, the proposed program has high potential to significantly aid in shortening the timeline from concept to demonstration for carbon control technologies.

An integrated carbon capture design for advanced power systems is in its infancy, having never been put into practice for coal-fired power generation, and is considered a high risk endeavor for the power industry. Commercially available non-integrated technologies (designed and built for other industries) would dramatically and unacceptably lower overall plant efficiency, while adding cost and complexity to the coal-fired plant. Although the DOE has sponsored alternative CO_2 capture technologies in the recent past, the R&D has been mostly limited to laboratory- or bench-scale evaluations under ideal conditions. Continued research and development is needed to validate these lab-scale efforts by testing and evaluating the promising alternative technologies under field

conditions that would be expected in a working plant. Specifically, large-scale testing and evaluation is needed to verify that technology commercialization is feasible. The establishment of the CRC at the PSDF will help to fill the existing gap between the successful small-scale R&D and the commercial applications.

The CRC is proposing a broad array of technology development activities, including pre-combustion CO_2 capture for Integrated Gasification Combined Cycle (IGCC) plants, post-combustion CO_2 capture for Pulverized Coal (PC) plants; and, emerging technologies such as oxy-combustion of CO_2. These R&D activities would support a pathway to a cost-effective advanced coal-generating plant with CO_2 capture. The flexibility and scale of the proposed CRC would be well suited to test gas cleanup and CO_2 capture technologies. The CRC could test multiple projects in parallel with a wide range of test equipment sizes leading up to pre-commercial equipment sufficient to guide the design of full commercial scale power plants. The CRC would support the development of cost-effective CO_2 capture technologies for advanced coal-fueled power plants as well as existing and new pulverized coal power plants.

PSDF

The PSDF is located on 16.6 acres of land, northeast of the town of Wilsonville in Shelby County, Alabama. The PSDF property is located within the Plant Gaston utility plant site. The PSDF can be used to screen research projects, perform pilot testing, and conduct testing at pre-commercial scale in an industrial setting. The PSDF is operated by Southern Company Services on behalf of industrial partners under funding from DOE, as a unique R&D test facility. The facility is large enough to produce commercially representative data while remaining sufficiently small for economic operation as a test facility. The effectiveness of the PSDF has been established. It has already fulfilled a major DOE objective by accelerating development of the Transport Gasifier to the demonstration phase.

The PSDF provides an engineering-scale testing facility for key components of an IGCC power plant. IGCC plants are so called because they use synthetic gas which is produced in a gasification unit in the plant. The gasification process produces heat, and this heat is reclaimed by steam boilers. The PSDF is adaptable to a variety of technology research needs. The components being tested are integrated into the plant, which exposes them to the requirements and rigors of real plant operating conditions and allows them to be scaled-up with confidence for commercial demonstration. Integrated operations allow the effects of system interactions to be understood. These interactions can typically be missed in unintegrated testing. In addition to engineering-scale testing, the PSDF has slipstream testing capability over a wide range of flowrates for cost-effective technology screening (**see Figure 2-1**). The PSDF operates approximately 2,200 hours per year in 3 or 4 distinct cycles of research (each cycle lasts an average of 550 hours, equivalent to 23 days). Each operation cycle burns approximately 1,000 tons of various types of coal.

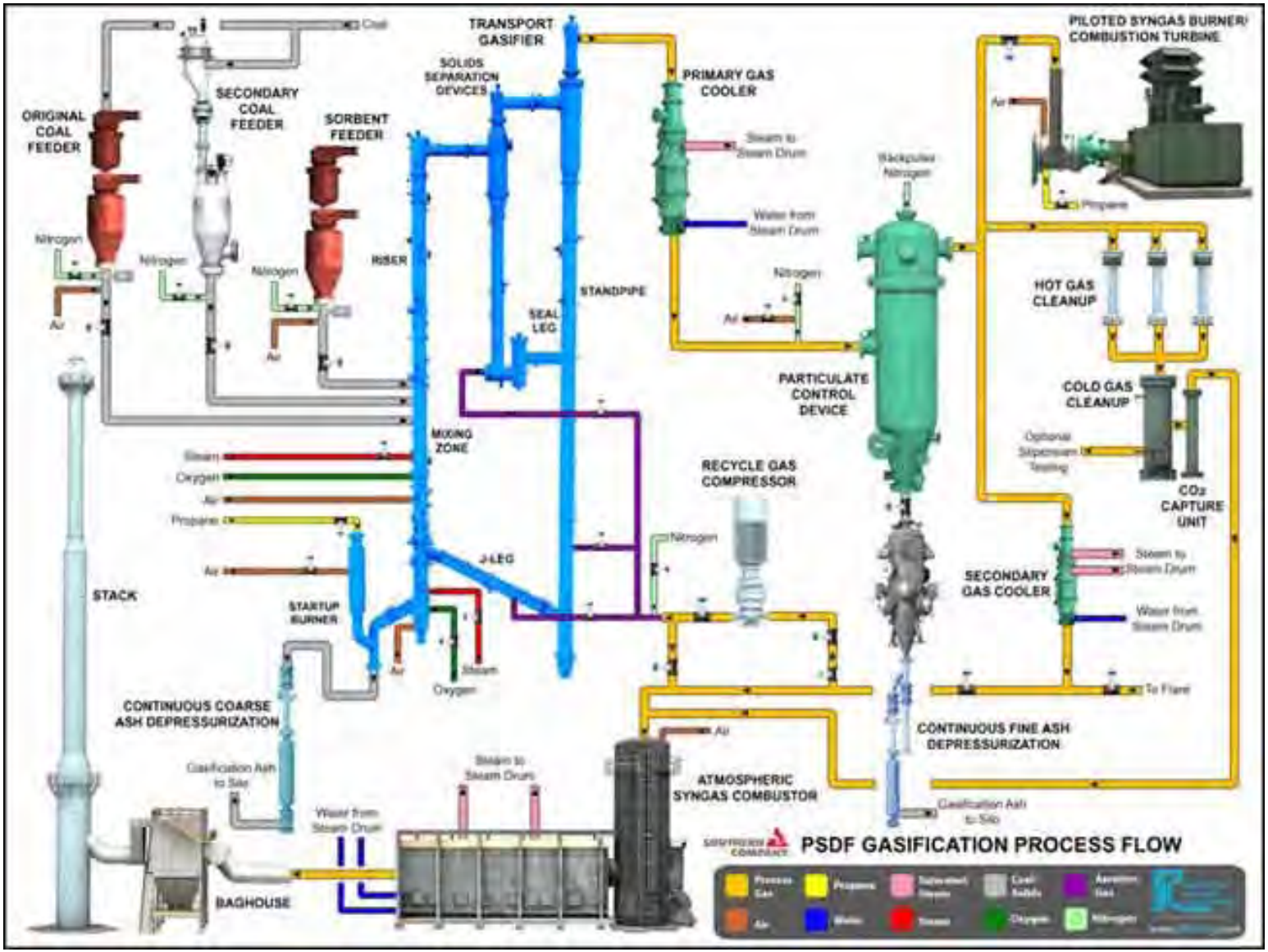

Figure 2-1. PSDF Process Flow Diagram
(Source: Southern Company, 2007)

The PSDF project was initiated September 14, 1990. Upon completion of construction and commissioning, the first coal-fired operations began in August 1996. The current funded Cooperative Agreement is currently set to expire on September 30, 2008. However, research and development efforts at the PSDF, in the form of the CRC, are proposed for another 5-year period. The initial EA for the development, construction, and operation of the PSDF was issued with a Finding of No Significant Impact (FONSI) in 1993. The proposed action currently being evaluated is for DOE to provide, through a 60-month cooperative agreement with Southern Company Services, Inc., financial assistance for the proposed development of the CRC Project at the PSDF plant. If approved, DOE would provide project assistance to test components and advanced power systems, including carbon (in the form of CO_2) capture technology, under realistic conditions using coal-derived gas streams. A small component of the CRC project, the post-combustion CO_2 capture component, would be located at Plant Gaston.

No major modifications to existing operational permits for either the PSDF or Plant Gaston are anticipated to be required as a result of the implementation of the proposed action. However, some minor permit modifications may be required. No previously undisturbed ground would be developed. The project would primarily involve the continued operation of the PSDF facility for a period of 5 years, with the installation of new components on existing facilities in order to research and develop carbon capture technologies.

The R&D conducted at the CRC as the Proposed Action would consist of the following three components:

- Pre-combustion CO_2 capture for IGCC plants;
- Post-combustion CO_2 capture for PC plants; and,
- Emerging technologies such as oxy-combustion of CO_2.

Pre-combustion CO_2 Capture

Pre-combustion CO_2 capture relates to coal gasification plants, where fuel is converted into gaseous components by applying heat under pressure in the presence of steam. In a gasification reactor, the amount of air or oxygen available inside the gasifier is carefully controlled so that only a portion of the fuel burns completely. This "partial oxidation" process provides the heat necessary to chemically decompose the fuel and produce synthesis gas (syngas), which is composed of hydrogen, carbon monoxide (CO) and minor amounts of other gaseous constituents. The syngas is then processed in a water-gas-shift reactor, which converts the CO to CO_2 and increases the CO_2 and H_2 mole concentrations to 40 percent and 55 percent, respectively, in the syngas stream. At this point, the CO_2 has a high partial pressure (and high chemical potential), which improves the driving force for various types of separation and capture technologies. After CO_2 removal, the H_2 rich syngas can be converted to electrical or thermal power. One application is to use H_2 as a fuel in a combustion turbine to generate electricity. Additional electricity is generated by extracting the energy from the combustion turbine flue gas via a heat recovery steam generator. **Figure 2-2** shows the research pathways being pursued for pre-combustion CO_2 capture.

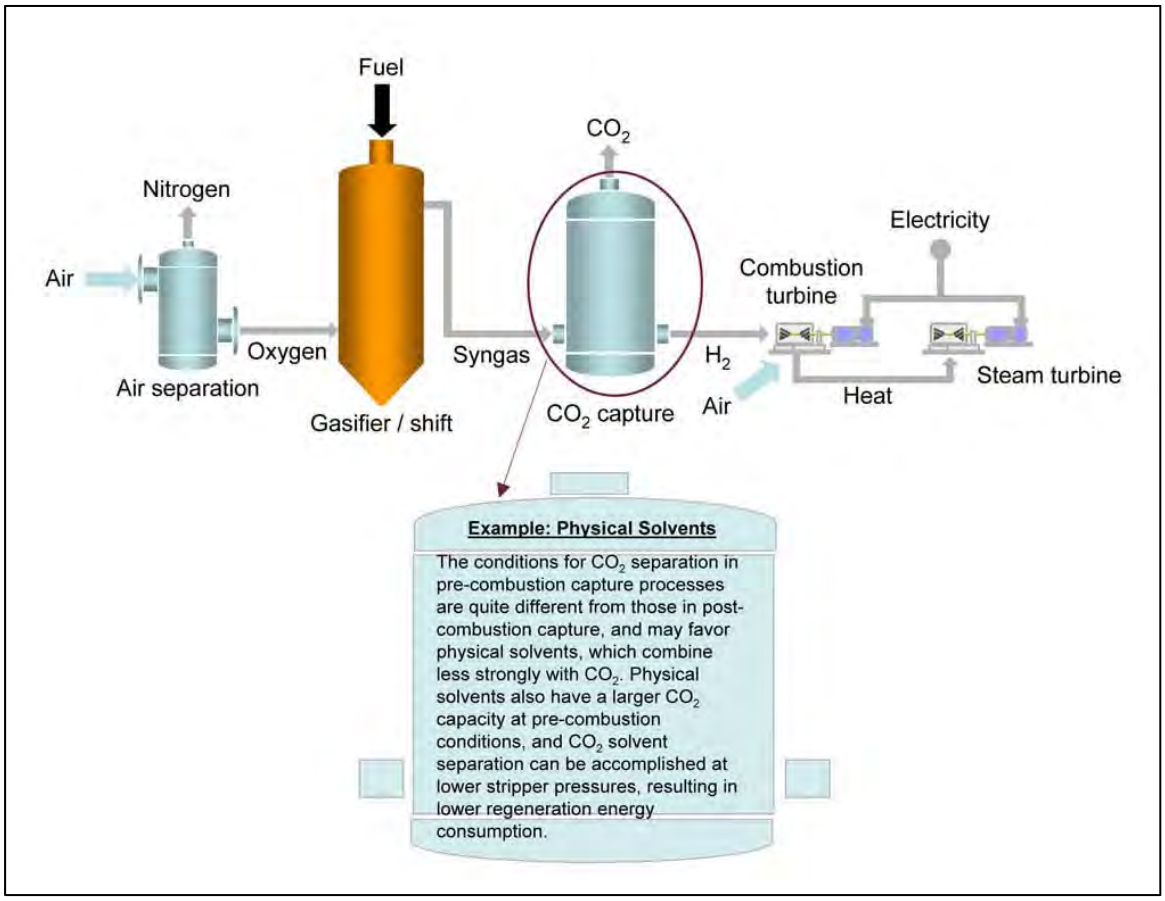

Figure 2-2. Pre-Combustion CO_2 Capture Diagram
(Source: DOE, 2007)

The backbone of the CRC pre-combustion CO_2 capture technology development will be a high-pressure, flexible facility designed to test an array of solvents and contactors in a CO_2 capture test facility. New construction to accommodate the facility at the PSDF will chiefly consist of two new concrete pads on the existing PSDF site. The primary area of construction would be immediately north of the existing facility on previously disturbed land to accommodate Water Gas Shift equipment, a new compressor, and a Gas Analyzer Building. This area is shown in **Figure 3-2**. The pad for the Water Gas Shift and compressor is projected to be 20' x 40' (800 ft^2), with approximately 2 ft. depth for construction. The pad for the Gas Analyzer Building is projected to be 30' x 15' (450 ft^2), with approximately 8" depth for construction.

The second area of disturbance at the PSDF would be previously disturbed land on the north side of the PSDF process structure, where an existing 20' x 35' pad would be modified to accommodate tanks and pumps for solvent storage, with approximately 2 ft. depth for construction. The duration of construction of the new pads required would be approximately 2-3 weeks each.

Slipstreams would be available with a range of gas flow rates and process conditions using actual syngas or flue gas for verifying and scale-up of fundamental R&D capture projects. To support the CO_2 capture test facility, development of water-gas shift is necessary. Current technology for water-gas shift using fixed beds of catalyst with high steam requirements is capital intensive with high operating costs. Several options are being considered to reduce costs; combining water-gas shift operation in the particulate filtration process and two improved contactor devices.

To gather information on the cost effectiveness of the tested technologies, all process blocks within the PSDF plant must be optimized in addition to the capture block. Including CO_2 capture in an advanced coal power plant will increase the plant cost of electricity, so opportunities to reduce cost in every part of the process will be explored. Although highest priority will be given to low-cost CO_2 capture process development, projects that reduce overall process capital cost and the cost of electricity will also be included in the CRC test plan to partially offset incremental cost increases due to the addition of CO_2 capture. These cost reduction projects include technology development for syngas cleanup, particulate control, fuel cells, sensors and controls, materials, and feeders.

Post-Combustion CO_2 Capture

Post-combustion CO_2 capture is primarily applicable to conventional coal-fired power generation, but may also be applied to gas-fired generation using combustion turbines. Any CO_2 emissions reduction plan for coal-fueled power generating plants must include post-combustion capture from pulverized coal plants due to their predominance in the generation mix now and in the near future. For both new and existing power plants, post-combustion capture technology must be made more efficient and cost-effective by developing alternative solvents with lower heats of regeneration and more compact, lower cost equipment.

In a typical coal-fired power generation system, fuel is burned with air in a boiler to produce steam; the steam drives a turbine to generate electricity, as shown in **Figure 2-3**. The boiler exhaust, or flue gas, consists mostly of nitrogen (N_2) and CO_2. Separating CO_2 from this flue gas stream is challenging for several reasons, including the dilute concentrations and low pressure that CO_2 is present at in the gas stream, and the presence of trace impurities in the flue gas which can degrade sorbents and reduce the effectiveness of certain CO_2 capture processes.

Absorption processes based on chemical solvents such as amines have been developed and deployed commercially in certain industries. To date, however, their use in PC power plants has been restricted to slipstream applications, and no definitive analysis exists as to the actual costs for a full-scale capture plant. Preliminary analysis conducted at NETL indicates that CO_2 capture via amine scrubbing and compression to 2,200 psia could raise the cost of electricity from a new supercritical PC power plant by 65 percent, from 5.0 cents/kilowatt-hour (kWh) to 8.25 cents/kWh. Some amines that may be used at PSDF-CRC for CO_2 capture testing include Mono ethanol amine (MEA), Methyl diethanol amine (MDEA), and proprietary hindered amines (chemical compounds containing an

amine functional group surrounded by a crowded steric environment). However, most solvents have not yet been identified, but will be selected as research progresses and suppliers develop suitable solvents.

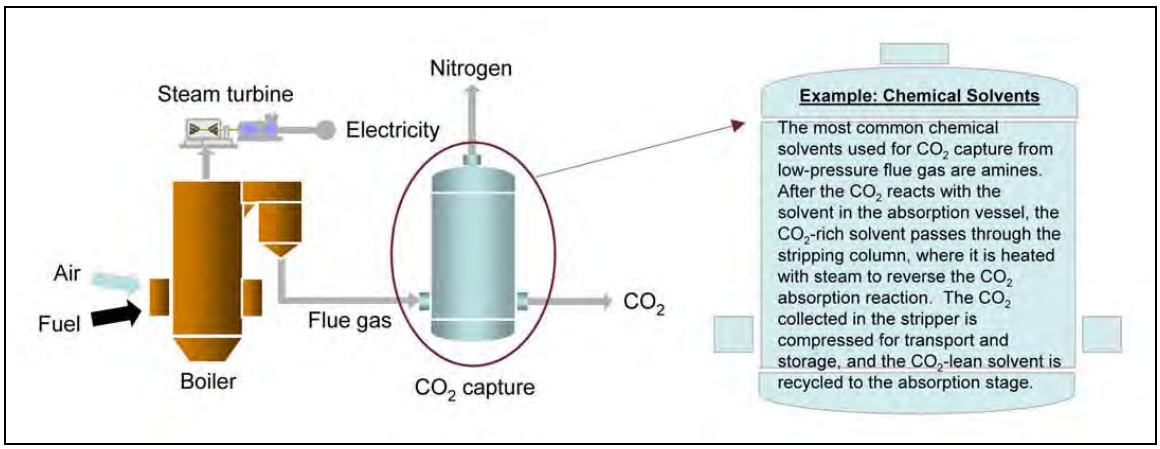

Figure 2-3. Post-Combustion CO_2 Capture Diagram
(Source: DOE, 2007)

Post-combustion CO_2 capture as part of the CRC will be studied at Alabama Power's Plant Gaston Unit 5, as Plant Gaston is a conventional pulverized coal fired plant. Unit 5 is a Combustion Engineering designed, 880 MW Tangentially fired boiler equipped with Selective Catalytic Reduction to reduce NO_x emissions, Hot ESP for Particulate Matter collection, and a Chiyoda Thoroughbred 121 (CT-121) Limestone Forced Oxidation FGD system for SO_2 control. The post-combustion CO_2 capture R&D efforts as part of the Proposed Action will be designed to support the evaluation of advanced solvents, processes and concepts, advanced solid sorbents, and membrane based processes, both at bench scale and with the potential for scale up to ~1-2 MW_e equivalent. The CRC will work with NETL, EPRI, vendors, technology developers, and national labs to identify new solvents, sorbents, membranes, gas contactors, and other processes and equipment that may prove beneficial and support the overall goal of the CRC.

To capture CO_2 from the flue gas at Plant Gaston, two larger trains (1-MW capacity each) and 5 smaller trains (about 1-MW capacity total for all five) would be installed adjacent to Unit 5 of the plant in a previously developed area, identified in **Figure 1-2**. Land disturbance at Plant Gaston would consist of the installation of new concrete foundations on an approximately 50' x 150' area (7,500 ft^2), and the utilization of an additional 50' x 50' area (2,500 ft^2) for infrastructure and support systems. These areas would be located to the West of the existing Unit 5 ID fan yard and to the South and East of the new Unit 5 FGD stack. Foundation depths would be approximately 50 ft and would include a combination of pilings, casings, and area pads. The duration of construction of the new pads would be approximately 2-3 weeks each. The total potential operating capacity of proposed post-combustion pilot project is limited to about 2-MW equivalent, due to operating and infrastructure costs. This project could be operated for extensive periods to fully characterize performance on real coal fired flue gas.

Oxy-Combustion of CO_2

The objective of oxygen-fired combustion is to combust coal in an enriched oxygen environment using pure oxygen diluted with recycled CO_2 or H_2O (**Figure 2-4**). The oxygen in the mixture will be largely consumed during the combustion reactions. Under these conditions, the primary products of combustion are CO_2 and H_2O, and the CO_2 can be captured by condensing the water in the exhaust stream.

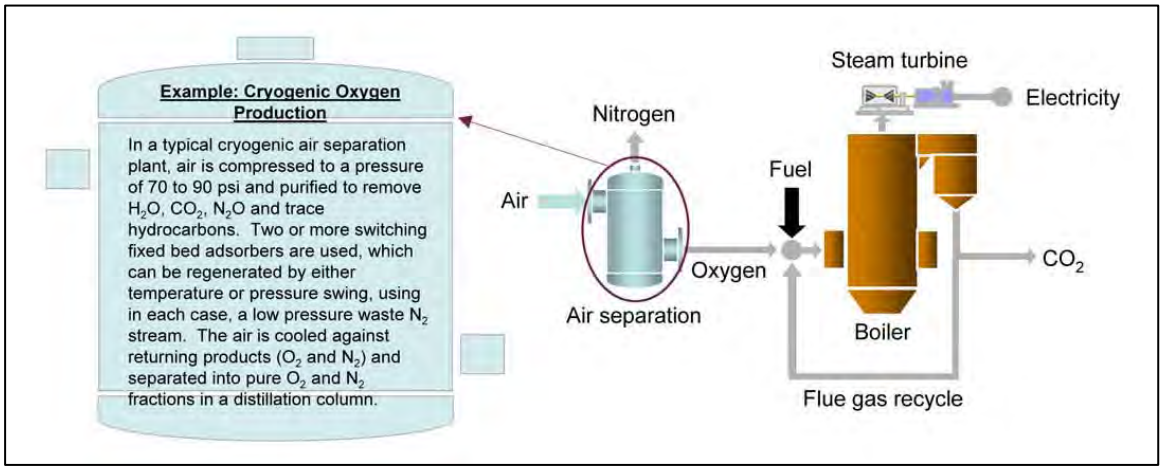

Figure 2-4. Oxy-Combustion CO_2 Capture Diagram
(Source: DOE, 2007)

Operating the Transport Combustor as a pressurized, circulating fluid bed combustor may provide a useful alternative to current oxy-combustion testing. The current testing programs for O_2-blown coal combustion rely on CO_2 recycle to control the combustor temperature. Operations and Maintenance costs for the recycle compressors are high, because the required recycle CO_2 flowrate is very high, essentially the same as the rate of N_2 in the air-blown combustion process. Temperature control by circulating solids for a Transport Combustor is simple and proven and will greatly reduce the amount of CO_2 to be recycled resulting in cost savings. The CRC test plan includes system modeling and economic analysis to evaluate the commercial feasibility of operating the Transport Combustor in oxy-combustion mode. If modeling results are positive, an engineering study will be conducted to determine the cost of modifying the Transport Combustor to operate in the oxy-combustion mode. Oxy-combustion test priority will then be determined in collaboration with NETL.

2.2 ALTERNATIVE 2: NO ACTION ALTERNATIVE

Under the No Action alternative, the DOE would not provide funding to establish the PSDF CRC. If DOE funding were eliminated to the PSDF CRC, the possible outcomes could include reduction in scope of work of the CRC, procuring other funding sources, or discontinuing the project. The most likely scenario, and the only scenario considered reasonable for the purposes of this analysis, is that the CRC project would be cancelled.

There is no other facility available that could provide the flexibility and system integrated demonstration information at its size range that the proposed PSDF CRC would produce. Project cancellation would mean this facility is not available to provide accelerated development for lower cost and more efficient CO_2 capture solutions for coal-based power generation.

2.3 ALTERNATIVES CONSIDERED BUT DISMISSED

CEQ regulations for implementing NEPA require that Federal agencies explore and objectively evaluate all reasonable alternatives to a proposed action and to briefly discuss the rationale for eliminating any alternatives that are not considered in detail. For this project, research into solvent, sorbent, membrane, and oxy-combustion systems as a means to capture CO_2 generated from coal-burning generating plants is proposed. No viable alternative locations for this research have been identified. The infrastructure in place at the PSDF is not currently developed at other R&D facilities and laboratories, and other locations would require the addition of substantial capital costs in order to perform the proposed R&D activities. The PSDF represents a full scale research facility with nearly all required infrastructure for the proposed activities already established.

The solvent, sorbent, membrane, and oxy-combustion systems identified under the Proposed Action represent the initial range of alternative CO_2 capture systems currently under consideration for research at the PSDF. The proposed CO_2 capture systems selected for initial evaluation as part of the Proposed Action were selected after 1) creating an inventory of potential candidate technologies by evaluating a variety of sources (including the Clean Coal Technology Roadmaps from DOE and from EPRI, and the R&D Plan from CoalFleet), 2) discussions with organizations such as DOE and EPRI, 3) evaluating highest cost capture equipment areas, and 4) screening based on such factors as cost/benefit, likelihood of technical success, schedule, availability of data to support performance targets, timely development to commercial scale, and ability to integrate into the PSDF.

However, the five year plan of the proposed project is dynamic, and technologies will continue to be screened and identified at least annually in order to accommodate new projects developed by DOE, industry, and others, and, to accommodate adjustments to priorities in response to test results from the previous year. The ongoing technology screening is expected to evolve and will encompass further inventorying of potential candidate technologies, establishing/refining screening criteria and scoring/ranking for prioritization of testing. This will be done in association with established budgets and goals and in conjunction with a project advisory team consisting of DOE and other major co-funders of the proposed project.

3.0 AFFECTED ENVIRONMENT

3.1 GEOLOGY AND SOILS

The PSDF/Plant Gaston site is located in a geologically complex portion of the Coosa Valley in Alabama. The Floyd-Parkwood shale, a dark gray fissile shale that underlies the site, has been extensively folded due to ancient tectonic activity. The majority of joints and faults that formed as a result of this folding have been filled with calcite. The presence of calcite may indicate that the shale is relatively impermeable along these surfaces; thus, groundwater movement may be very slow through the shale. Both surface and subsurface information from available geological mapping sources indicates that no faults intersect the proposed site. The nearest fault is southeast of the site and is beyond the range of any potential influence; this fault has been interpreted to be inactive and sealing.

The Coosa River Valley extends throughout the northeastern portion of the state. Elevations near the project site typically range from between 400 and 500 feet (ADEM, 2006a). Soils underlying the PSDF facility have been derived from the weathering of the Floyd shale; they are predominately of the Townley Silt Loam series, with a small portion of the site found on the Townley-Urban Land Complex series (**see Figure 3-1**).

Figure 3-1: Soil Map of Project Area

Figure 3-2: Existing Groundcover at Proposed Project Site

Both soil types are found on slopes ranging from 4-25%; they are well drained with slow permeability. Soils are typically 20-40 inches deep, with soft, consolidated bedrock beneath the soil consisting of Floyd shale. These soil types are formed and mostly found in forested areas. However, at the PSDF and Plant Gaston site location, the majority of land area has been converted to industrial uses (NRCS, 2007). **Figure 3-2** illustrates the current ground cover in the immediate vicinity of a project site at the PSDF. This area currently has 6-8 inches of aggregate on top of previously filled and graded land.

3.2 WATER RESOURCES

3.2.1 Surface Water

Three surface water bodies are located within one-half mile of the PSDF (**see Figure 3-3**). These include the Coosa River, Yellowleaf Creek, and an unnamed tributary to Yellowleaf Creek.

Coosa River

The Coosa River flows through a large section of Alabama; from the northeastern border with Georgia it travels south and converges with the Tallapoosa River in the middle of the state. Coosa River stream flow past Plant Gaston is completely regulated by the operation of the Logan Martin and Lay Dams at Coosa River Miles 99.5 and 51.3, respectively. The Plant Gaston/PSDF site is located near the northern portion of the Lay Dam Reservoir. The United States Geological Survey (USGS) water level gauge at Plant Gaston averages water level in the Coosa River adjacent to the plant to be between 13 and 14 feet above stream gage level. Due to the damming both up and downstream of Plant Gaston, water level within the Coosa River does not fluctuate greatly throughout the year; water levels are typically highest in March (averaging 14.04 feet above stream gage level), and lowest in October (averaging 13.48 feet above stream gage level) (USGS, 2008). Primary water uses for the Coosa River between the Logan Martin and Lay Dams are for industrial process cooling water, potable water supplies, recreation, and hydropower generation. The designated uses established by the Alabama Department of Environmental Management (ADEM) for the Coosa River within this reach are for Public Water Supply, Swimming, and Fish and Wildlife (ADEM, 2007a).

Section 303 of the Clean Water Act (CWA) established Total Maximum Daily Loads (TMDL) as a calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards for its designated use. Many pollutants have been assessed and given TMDLs, including heavy metals, nutrients, turbidity and organic compounds. These water quality standards and designated uses are promulgated under the CWA and enforced by each State. When a State deems a water body impaired, it is placed on the 303(d) List of Impaired Waters. It will then remain on this list until TMDL water quality standards are met. Currently, over 325 miles of rivers and streams in the Coosa River Basin, including the reach of the Coosa River adjacent to the project site, are included on the 303(d) List (ADEM, 2007a). The Coosa River near the project site is listed as impaired due to elevated levels of nutrients, organic enrichment/dissolved oxygen (DO), and priority organics (PCBs). The most likely causes of these impairments are flow regulation and modification, contaminated sediments, and upstream sources (ADEM, 2007a). A TMDL to address the elevated DO levels in the Coosa River was established in 2004, and a TMDL and commercial fish ban to address the elevated PCB levels was established in 2005.

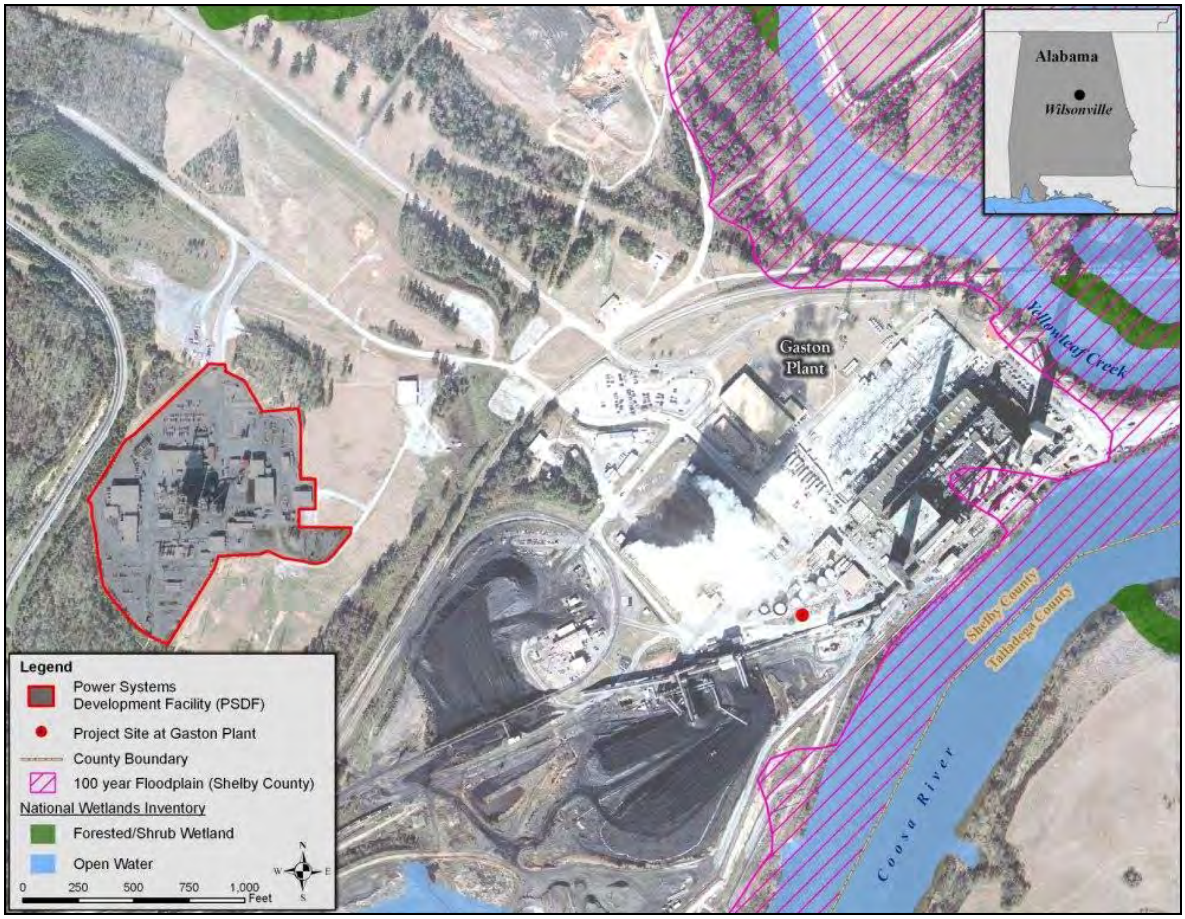

Figure 3-3: Aquatic Features of Project Area

Yellowleaf Creek and its Unnamed Tributary

Figure 3-4: Unnamed Tributary

The Yellowleaf Creek is a generally southern flowing tributary to the Coosa River, and it meets the river immediately north of the Plant Gaston site. Flow direction of the Yellowleaf Creek in the immediate vicinity of the project site is affected by water levels in the Coosa River and the water withdrawals in the area, including those of Plant Gaston. At normal full pool, the water in Yellowleaf Creek is about 20 feet deep at the unnamed tributary discharge point (DOE, 1999). The reach of Yellowleaf Creek in the vicinity of the project area is included on the 303(d) List of Impaired Waters for the same reasons as described above for the Coosa River.

An unnamed tributary to Yellowleaf Creek flows on the southern side of the PSDF site and parallels the onsite railroad tracks prior to meeting the Yellowleaf Creek (**Figure 3-4**). The length of the unnamed tributary is approximately 2,400 feet. The tributary is shallow and flows only intermittently. There is limited water quality data available for this waterbody; however, it is a discharge location for the PSDF and is therefore regularly monitored for a variety of potential contaminants (see below discussion under "Water Use and Discharge"). Currently, the discharge in the unnamed tributary meets all of its National Pollution Discharge Elimination System (NPDES) water quality requirements.

Water Use & Discharge

The PSDF service water system consists of separate systems to provide process water and potable water. Process water used in the cooling towers, firewater system and utility washdown is supplied from the Yellowleaf Creek via the intake structure at Plant Gaston. Process water used for steam and closed-loop cooling water systems is supplied by Plant Gaston from their demineralized water system. Potable water for domestic and sanitary use is obtained from the City of Wilsonville public water supply and metered to determine consumption. In lieu of a permitting system, Alabama requires water users to declare the quantity of water withdrawn for use or consumption by submitting a Declaration of Beneficial Use (DBU) to the Alabama Department of Economic and Community Affairs (ADECA), Office of Water Resources (OWR). A DBU requires the source and location of water withdrawal, the estimated amount as well as maximum quantity of the withdrawal and the primary use of the water to be diverted (ADEM, 2004). The Plant Gaston and PSDF property currently holds a joint approved DBU; water withdrawal from the Plant Gaston intake structure on the Yellowleaf Creek is estimated to be approximately 830 million gallons per day (gpd) for use at Plant Gaston,

and 0.031 million gpd for use at PSDF. The maximum quantities allowed under the DBU are 900 million gpd, and 0.5 million gpd, respectively (Alabama Power Company, 2003).

Water that is used throughout the plant processes is treated and discharged into area surface waters. The unnamed tributary receives NPDES-regulated discharged wastewater from the PSDF (see **Figure 3-5**), and both the Yellowleaf Creek and Coosa River receive discharged wastewater from Plant Gaston (ADEM, 2006b, 2007b). The existing facilities generate a total of approximately 825 million gpd from primarily the once-through cooling wastewater and ID Fan cooling wastewater of Plant Gaston (Southern Company, 2008). A net of roughly 5 million gpd of withdrawn surface water is consumed by the facilities.

Water discharges from the PSDF flow into the unnamed tributary; flow in the tributary is intermittent, and during summer months discharge percolates into the ground and/or evaporates before reaching Yellowleaf Creek. The unnamed tributary meets Yellowleaf Creek approximately 4,000 feet upstream from the confluence of Yellowleaf Creek and the Coosa River.

Figure 3-5: Discharge to Unnamed Tributary

Current wastewater treatment operations at PSDF include water collection by drainage from bermed areas, where chemicals are stored and process activities take place. The wastewater is drained to a 60,000 gallon collection basin where the water can be adjusted for pH, solids settling, and retention of oil. This discharge occurs in compliance with the facility's existing NPDES permit. Stormwater is conveyed to two drainage areas: one north and one south of the facility. The stormwater is tested for pH and suspended solids. Stormwater is not retained and its treatment relies on Best Management Practices (BMPs) such as vegetative cover, and rock barrier retainers and filters. Sanitary wastewater is collected by drainage to lift stations on site. The lift stations pump the sanitary wastewater to an activated sludge treatment unit. This unit has discharge limits for biological oxygen demand (BOD), total suspended solids, ammonia, and fecal coliform bacteria and dissolved oxygen; the wastewater is sampled on a routine basis by PSDF staff (Southern Company, 2008).

With the exception of the stormwater runoff, the discharge primarily consists of process water. Effluent from the process water could include runoff from the coal and limestone piles, process area wash water, sanitary wastewater, process wastewater, and general area

runoff. Major contamination concerns from these types of runoff could include changes in pH, elevated levels of suspended solids, metals, oils, grease, and changes in biological oxygen demand (DOE, 1999). As such, monitored effluent characteristics of process water include flow levels, pH, chlorine, temperature, phosphorus, magnesium, oil and grease, total suspended solids, benzene, ethylbenzene, toluene, xylene, aluminum, naphthalene, sulfate, biochemical oxygen demand, fecal coliform, ammonia, dissolved oxygen, total nitrogen, nitrates, and nitrites (ADEM, 2006b). At the Plant Gaston, monitored effluent characteristics are similar: flow levels, pH, chlorine, oil and grease, total suspended solids, arsenic, copper, iron, manganese, phosphorus, ammonia, nitrate and nitrite, toxicity to ceriodaphnia, and toxicity to pimephales (ADEM, 2007b).

3.2.2 Groundwater

The PSDF is located on the Floyd-Parkwood Shale Formation. Data collected from the site investigation indicated that groundwater occurring in this formation is non-continuous and that it is found either perched in the residual clay and decomposed shale or concentrated along joint and fault planes.

Regional groundwater supplies are provided from two major aquifers: the Knox-Shady and the Fort Payne-Tuscumbia aquifers. Aquifers in the region are typically associated with valleys that are separated by less permeable rocks outcropping on ridges. The major source of recharge to the aquifers is rainfall, with an estimated surface recharge of 5 inches per year. Most of the aquifers in the area are unconfined and may be susceptible to surface contamination. The formations which underlie the proposed PSDF site have little groundwater and groundwater that is present flows away from the project site (DOE, 1998).

3.2.3 Wetlands & Floodplains

There are no wetlands on the proposed project sites. However, there are stretches of forested/shrub wetlands in the immediate vicinity of the sites, along both the Coosa River and Yellowleaf Creek . These types of wetlands are typically found adjacent to rivers and are areas that are waterlogged for much of the year. Forested/shrub wetlands are typically dominated by broadleaf, deciduous trees such as cottonwoods, walnuts and sycamores (USEPA, 2006). In early 2007, approximately 550 acres of wetland and stream habitat was permanently protected along Yellowleaf Creek. The Freshwater Land Trust of Birmingham established this Yellowleaf Mitigation Bank approximately 10-20 miles northwest of the proposed project site**.** Nineteen counties in Alabama will be able to purchase wetland and stream credits in this location to offset the use of these types of environments during development projects (Westervelt Company, 2007).

The proposed project sites at the PSDF and Plant Gaston are not located within the 100-year floodplain (Southern Company, 2008). However, there are floodplains associated with each of the water bodies discussed above, in the immediate vicinity of the sites (as illustrated in **Figure 3-3**).

3.3 AIR QUALITY

Air quality is described by the concentration of various pollutants in the atmosphere. The significance of a pollutant concentration is determined by comparing the concentration in the atmosphere to applicable national and/or state ambient air quality standards. These standards represent the maximum allowable atmospheric concentrations that may occur and still protect public health and welfare with a reasonable margin of safety.

This section is a description of ambient air quality in Shelby County with respect to attainment of National Ambient Air Quality Standards (NAAQS), and identification of applicable air quality regulations to the PSDF.

3.3.1 National Ambient Air Quality Standards and Attainment Status

USEPA Region 4 and ADEM regulate air quality in Alabama. The Clean Air Act (CAA) (42 USC 7401-7671q), as amended, gives USEPA the responsibility to establish the primary and secondary NAAQS (40 CFR Part 50) that set acceptable concentration levels for seven criteria pollutants: fine particulate matter (PM_{10}), very fine particulate matter ($PM_{2.5}$), sulfur dioxide (SO_2), carbon monoxide (CO), nitrogen oxides (NO_x), ozone (O_3), and lead. Short-term standards (1-, 8-, and 24-hour periods) have been established for pollutants contributing to acute health effects, while long-term standards (annual averages) have been established for pollutants contributing to chronic health effects. Based on the severity of the pollution problem, nonattainment areas are categorized as marginal, moderate, serious, severe, or extreme. Each state has the authority to adopt standards stricter than those established under the federal program; however, the State of Alabama accepts the federal standards.

Federal regulations designate Air-Quality Control Regions (AQCRs) in violation of the NAAQS as "nonattainment" areas. Federal regulations designate AQCRs with levels below the NAAQS as "attainment" areas. "Maintenance" AQCRs are areas that have previously been designated "nonattainment," and have been redesignated to "attainment" for a probationary period through implementation of maintenance plans. The PSDF, and therefore the CRC, is completely within the Metropolitan Birmingham Intrastate AQCR (AQCR 004) (40 CFR 81.144). The USEPA has designated Shelby County as nonattainment for the $PM_{2.5}$ NAAQS, a maintenance area for the 8-hour O_3 NAAQS, and attainment for all other criteria pollutants (40 CFR 81.301).

3.3.2 Class I and II Areas

Class I Areas, as defined in the CAA, are national parks over 6,000 acres (2,428 ha), national wilderness areas and national memorial parks over 5,000 acres (2,023 ha), and international parks that were in existence as of August 7, 1977. The nearest Class I area, the Sipsey Wilderness Area, is located approximately 95 miles northwest of the site. Class II Areas are areas of the country protected under the CAA, but identified for somewhat less stringent protection from air pollution damage than a Class I area. Shelby County is considered a Class II Area.

3.3.3 Local Ambient Air Quality

ADEM and Jefferson County Department of Health Air Pollution Control Program monitor the concentrations of criteria pollutants in AQCR 004. Monitoring stations are located in Jefferson, Shelby, Sumter, Tuscaloosa, and Walker Counties. Worst case ambient air quality conditions can be estimated from maximum concentrations measured at these stations (**Table 3-1**).

Table 3-1
NAAQS and Area Air Quality

Pollutant and Averaging Time	Primary NAAQS[1]	Secondary NAAQS[1]	Monitored Data[2]
CO			
8-Hour Maximum[3] (ppm)	9	(None)	9
1-Hour Maximum[3] (ppm)	35	(None)	20
NO_2			
Annual Arithmetic Mean (ppm)	0.053	0.053	*(no data available)*
Ozone			
8-Hour Maximum[4] (ppm)	0.08	0.12	0.108
$PM_{2.5}$			
Annual Arithmetic Mean[5] ($\mu g/m^3$)	15	15	20.3
24-Hour Maximum[6] ($\mu g/m^3$)	35	35	64
PM_{10}			
Annual Arithmetic Mean[7] ($\mu g/m^3$)	50	50	56
24-Hour Maximum[3] ($\mu g/m^3$)	150	150	241
SO_2			
Annual Arithmetic Mean (ppm)	0.03	(None)	0.003
24-Hour Maximum[3] (ppm)	0.14	(None)	0.014
3-Hour Maximum[3] (ppm)	-	0.5	0.032

1 - Source: 40 CFR 50.1-50.12.
2 - Source: USEPA, 2008.
3 - Not to be exceeded more than once per year
4 - The 3-year average of the fourth highest daily maximum 8-hour average O_3 concentrations over each year must not exceed 0.08 ppm.
5 - The 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from must not exceed 15.0 ug/m^3.
6 - The 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor must not exceed 65 ug/m^3.
7 - The 3-year average of the weighted annual mean PM_{10} concentration at each monitor within an area must not exceed 50 ug/m^3.

With the exception of the eight-hour O_3, 24-hour $PM_{2.5}$, and 24-hour PM_{10} standards air-quality measurements are below the NAAQS (USEPA, 2008). The reported maximum of 0.103 parts per million (ppm) for the eight-hour level exceed the standards of 0.08 ppm. However, the 3-year average of the fourth highest daily maximum 8-hour average O_3 concentrations over each year has not exceeded 0.08 ppm; hence, the attainment status. The reported maximum of 64 micrograms per cubic meter ($\mu g/m^3$) for the 24-hour $PM_{2.5}$ level exceed the standards of 35 $\mu g/m^3$. However, it was only exceeded once; hence, the attainment status. The reported maximum of 241 $\mu g/m^3$ for the 24-hour PM_{10} level exceeded the standards of 150 $\mu g/m^3$. However, the 3-year average does not exceed 150;

hence, the attainment status. Notably, all the highest levels were monitored in Jefferson County.

3.3.4 Regional Emissions

As part of its State Implementation Plan (SIP) of the CAA, ADEM compiles a region wide emissions inventory of the Metropolitan Birmingham Intrastate AQCR, and sets regional emissions budgets. **Table 3-2** lists the estimated total emissions for the region. Notably, the region has no applicable SIP for the $PM_{2.5}$ NAAQS; therefore no USEPA approved regional emissions budget is in place for $PM_{2.5}$ and its precursors. The SIP revisions to address nonattainment conditions with respect to the $PM_{2.5}$ NAAQS are being developed and are expected to be approved by USEPA by 2009.

Table 3-2
Regional Air Emissions within the Metropolitan Birmingham Intrastate AQCR

Criteria Pollutants	Annual Emissions (Tons per Day)
Volatile Organic Compounds (VOC)	112
NO_x	177

Source: ADEM, 2005.

3.3.5 Greenhouse Gasses and Global Warming

Greenhouse gases (GHG) are components of the atmosphere that are generally considered as contributing to the greenhouse effect and global warming. Some greenhouse gases occur naturally in the atmosphere, while others result from human activities such as the burning of fossil fuels. Federal agencies, states, and local communities have prepared GHG inventories and adopted policies that would result in a decrease of greenhouse gas emissions. According to the Kyoto Protocol and California Climate Action Registry, there are six GHGs: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6) (UNFCC, 2007;CARB, 2007). Although the direct GHG (CO_2, CH_4, and N_2O) occur naturally in the atmosphere, human activities have changed their atmospheric concentrations. From the pre-industrial era (i.e., ending about 1750) to 2004, concentrations of CO_2 have increased globally by 35 percent. Within the United States, fuel combustion accounted for 94 percent of all CO_2 emissions released in 2005. On a global scale, fossil fuel combustion added approximately 30 $x10^9$ tons (27 $x10^9$ metric tons) of CO_2 to the atmosphere in 2004, of which the United States accounted for about 22 percent (USEPA, 2007a). DOE's Energy Information Administration (EIA) report indicates that U.S. CO_2 emissions have grown by an average of 1.2 percent annually since 1990 and energy-related CO_2 emissions constitute as much as 83 percent of the total annual CO_2 emissions.

Since 1900, the Earth's average surface air temperature has increased by about 1.2 to 1.4ºF. The warmest global average temperatures on record have all occurred within the past 15 years, with the warmest two years being 1998 and 2005 (USEPA, 2007b). With

this in mind, the DOE while preserving their core operations is poised to support climate-change initiatives to reduce GHG emissions.

3.4 BIOLOGICAL RESOURCES

3.4.1 Vegetation

The PSDF is located in a region dominated by Oak-Pine forests. These ecosystems are characterized by numerous oaks (white, northern, and southern red), and pines (loblolly pine being the most characteristic) in a rolling topography. The forest canopy also includes sourwood, sweetgum, and various hickory species. The non-forested areas nearby contain numerous species of grasses and herbs including fescue, orchard grass, verbena, wild petunia, and honeysuckle (DOE, 1998). As discussed above, the immediate project area is small and limited to previously developed land (Southern Company, 2008). **Figure 3-2** illustrates the current land cover which is developed and lacking any vegetation.

3.4.2 Wildlife

Species diversity for wildlife populations occurring on the proposed project site is limited due to previous development, existing use, and small general area of the site. Nearby resident upland species include white-tailed deer, gray squirrel, red-bellied woodpecker, blue jay, Carolina chickadee, tufted titmouse, Carolina wren, brown thrasher, pine warbler, northern cardinal, rufous-sided towhee, and the eastern box turtle (DOE, 1998).

Aquatic species living in Yellowleaf Creek include a diverse fish community with 47 species representing 10 families. Yellowleaf Creek is also home to numerous snail and mussel species. The Coosa River is also home to a diversity of aquatic species; no other river basin in North America has a higher percentage of endemic species than the Upper Coosa River. Closer to the project site, in the Lower Coosa River and Lay Lake, dominant fish species include sport fish such as bass, catfish, bluegill, and other sunfish (DOE, 1998; CRBI, No date).

3.4.3 Threatened & Endangered Species

Both the Coosa River and the Yellowleaf Creek are home to several state- or federally-listed threatened or endangered species. The Coosa River is home to several listed fish, mussel, and snail species. Listed fish species include the Blue shiner, Cherokee darter, Goldline darter, Etowah darter, Amber darter and others. Mussel species include the Finelined pocketbook, the Alabama and Coosa moccasinshells, the Southern clubshell and the Rayed kidneyshell. Additionally, the Cylindrical lioplax and the Interrupted rocksnail are both federally endangered snail species found in the Coosa River (CRBI, No date).

Similar to the Coosa River, the Yellowleaf Creek has several state- or federally-listed threatened or endangered fish, mussel, and snail species. A 25-mile portion of Yellowleaf Creek is federally designated critical habitat for four threatened or endangered mussels; the Coosa Moccasinshell, Finelined pocketbook, Southern pigtoe, and Triangular

kidneyshell. The designated critical habitat ends 1.4 miles upstream of the Plant Gaston intake structure. The Tulotoma Snail (*Tulotoma magnifica*) is a federally listed endangered snail which is known to occur on the rip rap of the Plant Gaston intake structure on the bank of Yellowleaf Creek, where it is attracted to the conditions caused by the turbulent intake water.

The Yellowleaf Mitigation Bank being established northwest of the PSDF plans to provide permanent protection for four federally threatened or endangered mussel species, one state-listed mussel species, one endangered snail species, and one special concern plant species as determined by federal and state natural resource agencies (Westervelt Company, 2007). Though there are several state and federally listed aquatic species found in the vicinity of the project site, there are no known terrestrial plant or animal species found on the PSDF property or within the immediate vicinity of the project site (Southern Company, 2008).

3.5 WASTE AND HAZARDOUS MATERIALS MANAGEMENT

3.5.1 Waste Management

The PSDF generates approximately 25 tons of municipal solid waste per year. Municipal waste generated at the PSDF is transferred to the Pineview Regional Landfill in Dora, Alabama, which is owned and managed by Browning-Ferris Industries (BFI). Materials such as office paper, cardboard, plastics, and metals are collected at the PSDF and transported for recycling whenever possible. Between 2-3 tons of paper are collected for recycling from the PSDF per year.

In addition to municipal waste, the PSDF generates approximately 700 tons per year of coal ash and coal byproducts. This material is stored in two silos capable of holding 100 cubic yards each. Unused coal slated for site removal, and coal ash generated by the PSDF, are either transferred to the adjacent Plant Gaston coal pile for combustion with their coal, or sent to the Pineview Regional Landfill for disposal via a contracted vendor. Coal ash generated by Plant Gaston is disposed of onsite at a permitted ash landfill. Prior to use, coal and limestone are stored in a covered concrete bunker at the PSDF.

3.5.2 Hazardous Materials Management

The PSDF currently uses and manages a variety of hazardous and toxic substances, including propane, nitrogen, acids, bases, Heat Transfer Fluid, oxygen, and hydrogen. In compliance with new Department of Homeland Security (DHS) regulations designed to address a possible terrorism attack, Southern Company has inventoried and disclosed the chemicals stored at the site which exceed DHS threshold amounts. The DHS regulations apply to the PSDF because the facility exceeds the threshold for propane.

The PSDF is also permitted under the Federal Resource Conservation and Recovery Act (RCRA) and classified by the USEPA as a Small Quantity Generator of Hazardous Waste (USEPA ID # ALR000000216). The hazardous wastes currently generated at the PSDF include laboratory spent solvents, waste fuel, and spent paint thinner/cleaning solvents, and a combined total of about 4 tons/year of wastes are produced. Liquid hazardous and

toxic waste generated at the PSDF is collected in three satellite accumulation sites in metal drums and then moved to a covered shed, where it is held for less than 180 days. The waste is then transported offsite for disposal at Waste Management, Inc. located in Emelle, Alabama, which is a certified hazardous waste treatment, storage, and disposal facility.

BMPs for managing all onsite hazardous and toxic materials and waste are in place at the PSDF. These BMPs include proper storage facilities and locations for the chemicals, immediate response to spill and leaks, and proper disposal of the waste from spills and leaks. The PSDF has a Spill Prevention Control and Countermeasures Plan (SPCC) in place, which was prepared in accordance with good engineering practices to comply with USEPA's Oil Pollution Prevention Regulations, CFR Title 40 Part 112. The plan was implemented at the PSDF due to single above ground oil storage tank with an approximately 6,000 gallon capacity. The SPCC outlines how the PSDF would respond to significant oil spills, the strategies and methods used to minimize oil spills on nearby streams, and who is responsible for the plan. Spill prevention strategies used at PSDF include bermed tank and storage pads, oil spill supplies, and employees trained to respond to oil spills.

The PSDF is licensed to possess radioactive sources through the Alabama Department of Public Health, Office of Radiation Control. The PSDF license number is 1230. For handling and using radioactive materials, the PSDF adheres to the principle of As Low As Reasonably Achievable (ALARA) for employees at the site. As part of the program, only trained and authorized users are allowed to work with the sources and a physical inventory of all sources must be taken at periodic intervals. The site has a designated Radiation Safety Officer who serves as the overseer for the program. The program is subject to a state inspection and has had three inspections over the life of the program.

3.6 HUMAN HEALTH AND SAFETY

Primary concerns to human health and safety at the PSDF include the exposure of workers to air emissions from the existing facilities, chemicals stored onsite, and process gases. Section 3.3.1 discusses monitored air emissions and their potential impacts on human health. National and state ambient air quality standards represent the maximum allowable atmospheric concentrations that may occur and still protect public health and welfare with a reasonable margin of safety; these are also presented in Section 3.1. PSDF employees living in and around this area are regularly exposed to the existing ambient air quality which is heavily influenced by combustion activities at Plant Gaston.

The existing PSDF facility stores a limited number of materials or chemicals which could potentially pose a risk to employees or others with respect to safety and health. See Section 3.5 for detailed description of current chemical storage and employee handling and safety requirements. Storage facilities for the materials required to operate the facility, including nitrogen, oxygen, acids, bases, and propane, are designed to minimize this risk in addition to being designed for spill containment and the control of releases. Current operational risks due to the accidental release of process gases are minimal. The flare, which is an integral part of the PSDF, is used as a relief device for venting and destroying gases from the gasifier during emergency conditions and power system

shutdowns. To prepare for emergencies, routine safety, emergency response, and emergency evacuation drills have been, and will continue to be, conducted among the existing facility employees.

Existing operational noise levels are considered to be within the range of light industrial activities; typically not rising above 63 dB. This is well below the Occupational Safety and Health Administration's (OSHAs) limit of workers being exposed to not more than 90 dB over an 8-hour workday (OSHA, 2008). In areas of the PSDF where noise levels reach above 85 dB, employees are required to wear hearing protection. In addition, OSHA regulations which specify appropriate protective measures for all employees, including hardhats, eye covering, and other appropriate attire, are adhered to at the industrial areas of the PSDF and Plant Gaston.

3.7 CULTURAL RESOURCES

Cultural and historic resources are protected by a variety of laws and regulations, including the National Historic Preservation Act, as amended, and the Archaeological Resources Protection Act. Section 106 of the National Historic Preservation Act and implementing regulations (36 CFR 800) outline the procedures to be followed in the documentation, evaluation, and mitigation of impacts to cultural resources. The Section 106 process applies to any federal undertaking that has the potential to affect cultural resources.

The Alabama Historical Commission is the state agency charged with safeguarding Alabama's historic buildings and sites. The Commission administers 12 historic sites. There are no historic sites located within Shelby County; the historic site closest to the PSDF is the Confederate Memorial Park in Chilton County, located due south of Shelby County (AHC, 2008). The Confederate Memorial Park is the site of Alabama's only Old Soldiers Home for Confederate Veterans.

Though not regulated by the State as a historic site, the remains of three Confederate forts which were constructed in 1863 by Confederate troops under the command of Major W.T. Walthall, Commander of the military post at Talladega, exist approximately one mile from the PSDF on the Plant Gaston property.

No recorded archaeological sites are located within the project boundaries. There are no State-designated scenic highways in the Wilsonville area, and no local programs exist for designating scenic areas or vistas in the area.

The initial EA for the development, construction, and operation of the PSDF was issued with a FONSI in 1993. As part of this initial EA, consultation with the Alabama SHPO took place in 1992. On October 26, 1992, SHPO determined the project would not have an adverse effect on identified historic properties.

3.8 SOCIOECONOMICS

The socioeconomic region of influence for the proposed action is a three county area around PSDF where the majority of construction and site workers would reside and

where socioeconomic impacts are most likely to occur. The three counties are Shelby, Coosa, and Talladega Counties in Alabama. The closest municipality is Wilsonville, Alabama, located just west of the project site.

Between 2000-2006 (based on Census Bureau data), the population within this three-county area was approximately 202,000. Approximately 58% of the population is found within Shelby County, 5% in Coosa County, and 36% in Talladega County. Wilsonville, Alabama had a population of 1500 in 2000. Within Shelby County, approximately 85% of the population is white, 9% black, and 3% Hispanic or Latino. In Coosa County, 63% are white, 34% black, and 1.3% Hispanic or Latino, and in Talladega County, approximately 62% of the population is white, 30% black, and 1% Hispanic or Latino. The average demographics in the U.S. at this time were 75% white, 12.3% black, and 12.5% Hispanic or Latino. Within Alabama, 71% of the population was white, 26% black, and 1.7% Hispanic or Latino (USCB, 2006a, 2006b, 2000a, 2000b, 2000c).

The total civilian labor force for the region of influence was approximately 40,300 in 2000-2006; unemployment rates in both Shelby and Coosa Counties were approximately 3.8 percent while Talladega County had an unemployment rate of 9.5%. Comparatively, the unemployment rate was 4.6% in the United States and 3% in Alabama. The top three job types in Shelby County include the education, health care, and social services sector; the retail sector; and, the professional, scientific, and management sector. In Coosa County the top employment type is manufacturing, followed by retail, and construction. In Talladega, workers are also predominantly employed in manufacturing, education, health care, and social services, and retail. In Wilsonville, the top employment type is management and professional, followed by sales and office occupations, and construction. The average per capita personal income in 2000 (most recent Census Bureau data available for entire region) was $19,700 for the region of influence. For the same year, the per capita personal income was $21,875 for the United States, and $18,189 for Alabama (USCB, 2006a, 2006b, 2000a, 2000b, 2000c).

The PSDF usually has between 30-40 permanent construction employees and approximately 100 permanent Southern Company Services and Alabama Power Company employees. Fluctuations in employment levels at the PSDF change based on workload and construction status. During past construction phases, the number of construction employees has increased to approximately 70 during peak times (Southern Company, 2008).

4.0 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND ALTERNATIVES

4.1 GEOLOGY AND SOILS

4.1.1 Alternative 1: Proposed Action

The Proposed Action would involve ground disturbance at two small areas on the existing PSDF site to accommodate the installation new pre-combustion CO_2 capture equipment, including tanks, pumps and other equipment. The primary area of construction would be immediately north of the existing facility on previously disturbed land; this area is shown in **Figure 3-2**. The footprint of disturbance in this area is projected to be a total of 1,250 ft^2, with between an 8 inch and 2 ft depth for construction. The second area of disturbance at the PSDF would be previously disturbed land on the north side of the PSDF process structure, where an existing 700 ft^2 pad would be modified to accommodate tanks and pumps for solvent storage, with approximately 2 ft. depth for construction. The total footprint of land disturbance at the PSDF is estimated to be 1,950 ft^2.

As part of the proposed post-combustion CO_2 capture research, an approximately 7,500 ft^2 previously disturbed area located adjacent to Plant Gaston Unit 5 would be further developed to install new concrete foundations. An additional previously disturbed area approximately 2,500 ft^2 would be utilized for infrastructure and support systems. Foundation depths would be approximately 50 ft and would include a combination of pilings, casings, and area pads. A total footprint of disturbance of approximately 10,000 ft^2 would occur as part of the post-combustion CO_2 capture research at Plant Gaston.

Each of the locations proposed for development is relatively flat and firm with no potential for geologic instability or subsidence. As discussed in Section 3.1, the proposed area has very little to no potential for future faulting to occur. Geological resources are not expected to be impacted if the proposed action were implemented.

A limited amount of soils can be expected to be disturbed during the construction/development phase of the proposed action. However, all construction activities would occur on previously developed land that is covered with gravel, and the impact to native soils is considered negligible. A minimal amount of additional stormwater runoff can be expected to occur during construction activities and from the slight increase in impervious surface area of the sites. All site runoff during construction activities would be permitted by ADEM's state-issued general NPDES permit for construction activities of less than one acre. During operation, runoff would be permitted by the site's operations NPDES permit and all existing stormwater permit conditions would continue to be met.

The duration of construction of the new pads required would be short, only 2-3 weeks each, and the construction activities would be performed under the guidelines of the sites' BMP Plan. Standard construction BMPs, such as installing perimeter silt fences, spreading straw and mulch to protect exposed ground, covering stockpiles of earth or

soils, and so forth, will help further minimize runoff, erosion and impacts to on-site and off-site soils during construction activities. Overall impacts to geologic resources and soils from the Proposed Action are considered negligible.

4.1.2 Alternative 2: No Action

Under the No Action Alternative, no impacts to geologic resources or soils would be expected to occur. No construction activities or operational changes would occur that would impact soils. The possible decommissioning of the PSDF and demolition of facilities is not part of the scope of this EA.

4.2 WATER QUALITY IMPACTS

4.2.1 Alternative 1: Proposed Action

Surface Water

General construction impacts associated with the development of the proposed pre- and post-combustion CO_2 capture research sites could affect water resources by increased stormwater runoff from the sites during times of heavy rain, and, by contamination from construction activities infiltrating area soils and percolating down into the groundwater. Increased stormwater runoff from developed sites can lead to increased erosion of exposed soils, which leads to increased turbidity in surface waterbodies. The first flush of rains after a long dry period will carry pollutants deposited on pavement into soils and water bodies, posing a risk of contaminating water and harming aquatic life. The total footprint of disturbance associated with the proposed action at all PSDF and Plant Gaston locations is estimated to be approximately 11,950 ft^2 (0.27 acres), which is considerably less than the one acre threshold that triggers the need for most individual construction site permits under the NPDES regulations enforced by ADEM (ADEM, No date-b). The small footprint of new disturbance, combined with the extent of existing land development and stormwater management practices, should aid in minimizing stormwater runoff during construction activities. Additionally, the existing berms between Plant Gaston and the Coosa River will help to minimize stormwater runoff during the construction of the post-combustion CO_2 capture facility near Plant Gaston Unit 5.

The Coosa River and Yellowleaf Creek are the two nearby surface waterbodies that have the potential to be impacted under the Proposed Action. Both the PSDF and Plant Gaston have existing NPDES permits that allow discharge of pollutants to these waterbodies that meet limits established by the permit. Any new chemicals brought on site have the potential to be discharged through spills and accidents. New solvents will be required for the implementation of the CRC. Operational changes in runoff are also likely to occur. Runoff from the coal and limestone storage areas will be collected and pumped to the 60,000 gallon collection basin. Runoff from the storage piles is expected to be minor and is estimated to be approximately 5,000 gallons per year. Sheds cover the storage areas and runoff from that area is limited to the area immediately in front of the shed. ADEM will be informed of the presence of the new solvents; their use will be managed by BMP plans that are already in place, with the plans being modified as necessary to accommodate the presence of the new solvents. Therefore, the potential harm to a

receiving body should be mitigated by the small size of the proposed disturbance, by the BMP plans that are already in place, and by the existing treatment capabilities for some of the discharges such as solids settling, oil separation, pH adjustment, storage containers, and storage locations. It is not anticipated that a modification of the NPDES permit would be required for the addition of CRC-related construction and operations.

Neither the water quality of Coosa River, nor the unnamed tributary to Yellowleaf Creek, are expected to be impacted as a result of the proposed action.

Water Use & Discharge

During construction associated with the CRC, some runoff would be expected, but would likely be minimal and of short duration. The duration of construction of the new pads required would only be 2-3 weeks each, and the area of the new pads of such a small size, that negligible increases to runoff should occur. These activities would be performed under the guidelines of the PSDF BMP Plan. Construction activities associated with the Proposed Action are not likely to have more than short-term, minor impacts on nearby surface waters.

Once the CRC is operational, potable and process water will continue to come from the City of Wilsonville and the Yellowleaf Creek via the Plant Gaston intake structure, respectively. No modification of the existing DBU would be required for the addition of CRC equipment. Water use at the PSDF is expected to remain similar to, or increase slightly from, current amounts. These levels are estimated to be approximately 37,000 gpd; with a maximum quantity of 76,000 gpd. The majority of the water required for the pre-combustion facilities is already necessary for daily operations at PSDF; therefore this increase is negligible. Post-combustion CO_2 capture research water requirements will add an additional 35,000 gpd estimated usage, with a maximum usage quantity of 49,000 gpd (Southern Company, 2008). The 35,000 gpd of water needed for the post-combustion CO_2 capture facilities at Plant Gaston Unit 5 will be in addition to the nearly 830 million gpd required for operation of the PSDF/Plant Gaston facilities. It is anticipated that this will not result in any impact to either the Yellowleaf Creek or the Coosa River.

The CRC will be developed within a curbed basin that collects any spills associated with process discharges, as well as stormwater runoff from the site. This curbed area collects to a sump, which will be pumped either into existing yard drains (normal operation) or to storage containers in the event of a process spill or modification. The existing site drainage system carries runoff to the south into the existing coal pile runoff pond, where it is then pumped to the existing ash storage lake. The discharge of the ash storage lake is monitored according to the existing Plant Gaston NPDES permit (Southern Company, 2008).

Current wastewater quantities are described in Section 3.2.1; the non-contact cooling water system, and process water systems will both result in additional wastewater once the CRC is operational. Non-contact cooling water will increase to 827,000 gallons and process water will increase to 1,250,000 gallons. Section 3.2.1 also describes the components of wastewater that are monitored; this monitoring will continue as no changes to the NPDES permit are expected (Southern Company, 2008). The

implementation of the Proposed Action is likely to have no more than minor, adverse impacts on surface waters due to operational changes in runoff; no impacts to surface water quantity or water levels within any waterbodies are expected.

Groundwater

As described above, the proposed action will require the use of additional water resources. However, none of the additionally required water is expected to come from groundwater or be discharged underground. No impacts to groundwater resources within the vicinity of the proposed project site are expected.

Wetlands & Floodplains

Under the Proposed Action, no impacts to wetlands or floodplains are expected. No construction or operational activities or changes will occur in or adjacent to wetland or floodplain areas.

4.2.2 Alternative 2: No Action

If the No Action Alternative were to be implemented, negligible impacts would be anticipated to occur to surface water resources. Water withdrawal from the Plant Gaston intake structure would continue to supply daily operations at Plant Gaston, which are estimated to require approximately 830 million gpd. Water withdrawal for the proposed operations at the PSDF and the projected post-combustion CO_2 capture research activities at Plant Gaston are estimated at a combined average of 72,000 gpd (0.072 million gpd), or less than 0.009% of total withdrawal. The decrease in water withdrawal and use if the CRC was not implemented and the PSDF were not in operation is considered negligible relative to the quantities withdrawn and used by Plant Gaston.

The existing NPDES permit would not require modification or replacement. The No Action Alternative is not expected to result in impacts to the unnamed, intermittently flowing, tributary, Yellowleaf Creek, or the Coosa River. Additionally, no impacts to groundwater or wetlands and floodplains can be expected from implementation of this alternative.

4.3 AIR QUALITY IMPACTS

4.3.1 Alternative 1: Proposed Action

Short-term and long term minor impacts to air quality would be expected as a result of implementation of the Proposed Action. Direct and indirect air emissions would not exceed applicability thresholds, be "regionally significant," or contribute to a violation of any federal, state, or local air regulation.

Estimated Emissions and General Conformity

Implementing the Proposed Action would generate air pollutants during construction and introduce minor new stationary sources of pollutants, such as a hot water heater and a

gas-fired boiler for heating. All direct and indirect emissions associated with the Proposed Action were estimated (**Table 4-1**). The construction emissions would be generated by equipment use for site preparation and construction for the new facilities, including:

- The pad for the Water Gas Shift and compressor (20' x 40' x 2'),
- The pad for the Gas Analyzer Building (30' x 15' x 8"),
- The proposed Gas Analyzer Building itself,
- The pad for post combustion infrastructure and support systems (50' x 50' x 10'),
- The pad for post combustion gas capture system (50' x 150' x 50'),
- Minor surface paving, and
- Minor storm water and sewer upgrades.

The facility's operational emissions estimates included:

- Heating emissions from hot water heater and natural gas boilers, and
- Additional processing emission.

The general conformity rules (GCR) require federal agencies to determine whether their action(s) would increase emissions of criteria pollutants above preset threshold levels (40 CFR 93.153(b) and AAC 335-3-17-.02). These *de minimis* (of minimal importance) rates vary depending on the severity of the nonattainment and geographic location. To determine the applicability of the GCR to the Proposed Action, estimated air emissions from construction and operational activities were estimated and compared to the applicability thresholds under the GCR and the regional emission budgets. Emissions are expected to be below the applicability threshold for all criteria pollutants (**Table 4-1**), and would not be regionally significant for VOC and NO_x (**Table 4-2**). Pending the full implementation of the $PM_{2.5}$ NAAQS, there is no USEPA approved regional emission budget for $PM_{2.5}$ or SO_2. Due to the limited size and scope of the Proposed Action when compared to the overall regional activity, it is not anticipated that emissions of $PM_{2.5}$ or SO_2 would be regionally significant. Detailed emissions calculations are located in **Appendix A**.

Table 4-1
Project Emissions Compared to Applicability Thresholds

	Annual Emissions (Tons per Year)					
Activity	**VOC**	**NO_x**	**SO_2**	**$PM_{2.5}$**	**Applicability threshold**	**Would emissions exceed applicability levels? [Yes/No]**
Construction	0.9	5.5	0.0	0.3	100	No
Operations	1.0	21.0	17.0	3.4	100	No

Table 4-2
Annual Emissions Compared to Regional Emissions

	Criteria Pollutant or Precursor	
	VOC	**NO_x**
Project Emissions (tpd)	0.003	0.057
Regional Emissions (tpd)	112	177
Percent Regional Emissions	<0.01%	<0.01%
Regionally Significant?	No	No

Source: ADEM, 2005.
tpd = tons per day

Regulatory Review

Stationary sources of air emissions associated with the Proposed Action would be subject to federal and state air permitting regulations. ADEM oversees programs for permitting the construction and operation of new or modified stationary source air emissions for many industries and facilities that emit regulated pollutants in Alabama.

The permit rules and standards are found in Division 3 of the ADEM Administrative Code. These requirements include, but are not limited to, minor new source review (NSR), nonattainment new source review (NNSR), prevention of significant deterioration (PSD), and new source performance standards (NSPS) for selected categories of industrial sources. In addition, under the National Emission Standards for Hazardous Air Pollutants (NESHAP), new and modified stationary sources of air emissions may be subject to Maximum Achievable Control Technology (MACT) requirements if their potential to emit Hazardous Air Pollutants (HAPs) exceeds either 10 tons per year of a single HAP, or 25 tons per year of all regulated HAPs.

Based on the facility's potential to emit, PSDF is a major emissions source. A facility wide Title V permit was issued in October, 2003 (ADEM, 2003). The Title V PSDF air permit would not be affected by the new project. However, a modification or add-on to the existing facility air permit may be necessary. For example, a new steam boiler may have to be added for heating and process requirements. In these cases, the Air Division of ADEM would be contacted and the necessary application material submitted for a review. The steam boiler would carry its own individual permit requirements separate from the main gasifier permit. While a need to seek minor modifications may become necessary, it is anticipated that no increase in emission limits to the existing permit would be sought. The pre-combustion facility is projected to operate at a maximum of 2,500 hours per year.

Based on the facility's potential to emit, Plant Gaston Unit 5 is also a major source. The proposed post-combustion facility would not require modification to the Plant Gaston Unit 5 existing Title V air permit. Flue gas that is processed through the facility would be returned to the existing plant flue gas desulfurization (FGD) inlet duct, where it would be contacted again through the FGD as a final filter for the gas stream. Due to the chemistry and processes in which flue gas CO_2 is captured, it is expected that the traditional emissions of PM and acid gases (SO_2 and NO_x) would be reduced through the addition of

this facility. The only expected incremental emissions can be attributed to possible VOC slip (from solvent based processes) or sorbent attrition and slip (from solid adsorbent based processes). Because the organic solvents used in these processes are aqueous based, any VOC should be captured at a high efficiency in the existing Unit 5 FGD. Furthermore, the FGD design is highly efficient in capturing PM. For these reasons, very little air emission is expected from the Post-Combustion facility. Unit 5 would continue to be monitored to assure compliance with its existing Title V air permit.

Table 4-3
Air Quality Regulatory Review for Proposed Stationary Sources

Regulation	Project Status
Nonattainment New Source Review (NNSR)	The potential emissions would not exceed the NNSR thresholds. Therefore, a NNSR construction permit would not be required.
New Source Review (NSR)	The potential emissions may exceed the minor NSR threshold. Therefore, a minor NSR construction and temporary operating permit may be required.
Prevention of Significant Deterioration (PSD)	The proposed project would not result in a significant net emissions increase of any regulated pollutant, as defined by AAC 335-3-14-.04 (2)(c) and (w). Accordingly, the project would not be subject to PSD review.
Title V Permitting Requirements	Major modification threshold would not be exceeded. The PSDF and the Plant Gaston Unit 5 Title V Air Permits would not need updating.
National Emission Standards for Hazardous Air Pollutants (NESHAP)	Potential HAP emissions are not anticipated to exceed NESHAP thresholds. Therefore, the use of MACT would not be required.
New Source Performance Standards (NSPS)	Any new boilers rated greater than one million BTU installed would have to comply with NSPS.
tpy = tons per year	

The construction projects would be accomplished in full compliance with current Alabama regulatory requirements, through the use of compliant practices and/or products. Some applicable sections may include:

- AAC 335-3-3-.01 - Open Burning
- AAC 335-3-4-.01 - Visible Emissions
- AAC 335-3-4-.02 - Fugitive Dust and Fugitive Emissions
- AAC 335-3-6-.32 - Surface Coating
- AAC 335-3-6-.34 - Cutback and Emulsified Asphalt

Construction activities are expected to cause some localized dust. Standard mitigation techniques such as watering, erecting wind breaks, and using covers where practicable would be employed to minimize fugitive dust.

Greenhouse Gasses and Global Warming

Because operation of the PSDF is an integral part of research and development activities for the Proposed Action, release of CO_2 air emissions would occur during routine operations at the PSDF, as described in Section 3.3. Additional sources of emissions during research operations at the post-combustion area adjacent to Plant Gaston could include compressors, which are often equipped with automatic blowdown valves that depressurize compressors, bottles, separators, and interconnecting lines in the event of a shutdown. It is expected that emissions due to these additional sources would be very small. The majority of the CO_2 stream that would feed the system would otherwise be vented to the atmosphere without the Proposed Action. Therefore, CO_2 that is vented from the post-combustion unit during this project are emissions that would otherwise have occurred if the compression unit, pipeline, and CRC were not in place. Therefore, these sources of fugitive emission would not increase overall CO_2 emissions.

4.3.2 Alternative 2: No Action

Selecting the No Action Alternative would result in negligible impacts to ambient air-quality conditions. No construction would be undertaken and facility operations would be suspended. The relatively minute release of CO_2 from PSDF operations would not occur. Ambient air-quality conditions would remain as described in Sections 3.3.1. Indirectly, selecting the No Action Alternative, meaning that the proposed CRC would not be established and this project is not carried out in any setting, would delay planned larger-scale CO_2 reduction projects indefinitely. The increased understanding of CO_2 reduction technologies would not be gained.

4.4 BIOLOGICAL RESOURCES

4.4.1 Alternative 1: Proposed Action

Vegetation and Wildlife

As discussed above, all components of the Proposed Action will be occurring on previously developed land that is lacking vegetative cover and likely not habitat for wildlife. No impacts to terrestrial wildlife and vegetation are expected to result from the implementation of the Proposed Action. Aquatic species living in the unnamed tributary, Yellowleaf Creek, and the Coosa River are not likely to be impacted by the change in discharge coming from the activities associated with the Proposed Action, as discussed in Section 4.2.1.2. Although minor changes in water discharge will occur, these changes are not enough to warrant a modified or new NPDES permit. Changes in water discharge are not expected to result in more than negligible impacts to the nearby aquatic environments.

Threatened and Endangered Species

Under the Proposed Action, no impacts to State or Federally listed threatened or endangered species are anticipated to occur. Negligible impacts to water quality, water quantity, and the water velocity in the intake structure on Yellowleaf Creek, would occur as a result of construction and operation of the CRC. As a result, no impacts are anticipated to occur to the Tulotoma Snail which is found on the riprap of the intake structure.

Consultation regarding the Proposed Action was initiated with the USFWS on June 2, 2008, to ensure that the proposed project would result in no impacts to listed species. On June 24, 2008, the USFWS responded with concurrence that the project as described will have "no significant impact on fish and wildlife resources". A copy of the consultation letter with USFWS' stamped concurrence can be found in **Appendix B**.

4.4.2 Alternative 2: No Action

The No Action Alternative will not result in any impacts to wildlife or vegetation, as no construction activities or facility development is expected to occur. Additionally, the No Action Alternative is not anticipated to result in any impacts to threatened or endangered species found in the vicinity of the area.

4.5 WASTE AND HAZARDOUS MATERIALS MANAGEMENT

4.5.1 Alternative 1: Proposed Action

The amount of municipal solid waste (25 tons/yr) and coal ash waste (700 tons/yr) currently generated by the PSDF is expected to remain the same if the Proposed Action is implemented. The municipal solid waste would continue to be disposed of at the Pineview Regional Landfill, while the addition of a solids wetting system to the solids discharge silo in the latter part of 2007 to eliminate dusting allows all of the coal and coal-derived ash from the PSDF to be placed on the coal pile at the adjacent Alabama Power Company power plant. The quantity of coal byproducts and ash sent to the Pineview Regional Landfill is expected to be near zero under the Proposed Action.

The amount of hazardous waste currently generated by the PSDF (4 tons/yr) from laboratory spent solvents, waste fuel, and spent paint thinner/cleaning solvents, is expected to either remain the same under the Proposed Action, or to increase as a result of an increase in spent solvents from CRC R&D efforts.

New substances that are anticipated to be stored and used at the PSDF as part of the CRC include several hazardous or toxic substances, such as solvents (amine derivatives and amine compounds), anhydrous ammonia, catalysts containing metals such as nickel and cobalt, hydrogen sulfide, and sulfur dioxide. The solvents will be used for CO_2 absorption in liquid-gas contacting devices being tested.

Amines, salts of strong organic bases, are organic compounds and a type of functional group that contains nitrogen as the key atom. Some amines that may be used at PSDF-

CRC for CO_2 capture testing include Mono ethanol amine (MEA), Methyl diethanol amine (MDEA), and proprietary hindered amines (chemical compounds containing an amine functional group surrounded by a crowded steric environment). However, most solvents have not yet been identified, but will be selected as research progresses and suppliers develop suitable solvents.

Upon completion of testing of amine-based and other test solvents, if they are no longer needed for future testing, the solvents (and the cartridge filters utilized with the solvents, to remove impurities from the solvent system and improve the life of the solvent) will have to be collected and stored and then characterized as either hazardous or non-hazardous. Spent solvents and their cartridge filters will either be disposed of at a licensed waste management facility, sent to Plant Gaston's Unit 5 for combustion, or, if feasible, safely transported back to the vendor for recycling. If the solvents and cartridge filters are disposed of at Plant Gaston Unit 5, they would be combusted along with fuel. The primary impurities contained in the solvents would be salts of SO_2 and NOx,, and because the existing Unit 5 facility is equipped with high efficiency SCR and FGD for NO_x and SO_2 control, this proposed disposal method is considered the most environmentally friendly and safe approach.

It is assumed that this quantity of solvents will increase each year as processes are added for testing and the number of hours operation for each process is established. An initial quantity of approximately 12,000 lb/yr is projected for year 1, increasing to a maximum of approximately 68,000 lb/yr after 5 years. If all spent solvents tested are found to be hazardous wastes that can not be combusted nor recycled, they will add an additional 6 tons/year of hazardous waste to be safely disposed of in a licensed waste management facility, bringing the total facility wide amount of hazardous waste generated by the PSDF to approximately 10 tons/yr.

Each new chemical brought onsite to the PSDF or Plant Gaston as part of the CRC would be thoroughly investigated and classified before storage and use. All applicable safe handling, storage, use, and disposal precautions would be observed and adhered to. Though the quantity of hazardous and toxic materials would likely increase as a result of this alternative, it is not anticipated that this increase would result in more than negligible impacts to proper management of the materials.

4.5.2 Alternative 2: No Action

Under the No Action alternative, there would be no additional waste generated, and no new hazardous or toxic substances would be stored or used on site. While ultimate use of the PSDF, if the CRC project is cancelled, cannot be determined at this time, it is anticipated that the amount of waste generated from the site would decrease and that the resultant impacts associated with the No Action alternative on waste and hazardous materials management would be negligible.

4.6 HUMAN HEALTH AND SAFETY

4.6.1 Alternative 1: Proposed Action

The worker safety program requirements applicable at the project site location include the "construction" and "general industry" standards of the federal OSHA 29 CFR 1910 and 1926. These standards include walking-working surfaces, means of ingress and egress, operation of power equipment, adequate ventilation, noise exposure controls, fire protection, and electrical equipment safeguards. Because of the level and duration of air quality degradation expected during construction activities, the impacts to human health (workers and the public) can be expected to be minor, adverse, and short-term (See Section 4.3). Following the mitigation measures and BMPs will reduce the adverse impacts to human health from air quality. Workers would follow OSHA procedures, which would further reduce the impact to human health. With the addition of only 30-70 extra temporary employees, the risk of traffic accidents in and around the project site would be minimal. This area is not heavily trafficked, and the additional number of temporary workers would be well within the range typically experienced during other construction projects at the PSDF. Overall, impacts to human health are expected to be negligible to minor, adverse, and lasting only the duration of the construction.

Once the proposed CRC facilities are operational, OSHA procedures would continue to be followed to minimize worker exposure. These may include warning systems and alarms to detect exposures and spills, as well as informing the proper authorities of any incidents. The PSDF Safety Program has numerous worker safety and health programs to mitigate potential harm or exposure of employees such as: Respiratory Protection, Hearing Conservation, Bloodborne Pathogens, Scaffold Program, Fall Protection Program, Personal Protective Equipment, a Hazmat Response Team, Confined Space Rescue Team, a First Responder Group, and employees trained in First Aid and CPR.

There is always some potential for a worker to be exposed to chemicals. Section 4.5 discusses the changes in hazardous materials use and subsequent risk to employees as a result of the proposed action. Changes to existing processes and equipment, addition of new processes or equipment, or introduction of new chemicals (solvents, sorbents, etc.) would require appropriate training of workers to allow operation and testing of the equipment and otherwise ensure affected personnel are informed of the changes or additions (Southern Company, 2008). In addition, the existing Material Safety Data Sheets and Personal Protective Equipment requirements would remain in place to ensure that employees are prepared to handle any required chemicals. As discussed in Section 4.3, operational PSDF air emissions are not expected to change as a result of the CRC. It can be expected that workers will continue to be exposed to the same ambient air quality as they currently are. Additionally, operational noise levels are not expected to change; hearing protection will continue to be required in all high noise areas (Southern Company, 2008).

The existing PSDF has not had a lost-time injury since the safety record began on August 1, 1995. Job Safety Briefings are held before any non-routine job begins on a daily basis or as needed. It can be assumed that these procedures will remain in tact and that all personnel will be properly trained or briefed to ensure their safety while operating the

new facility components. Given the small size of risks and additional exposures, overall impact to human health from the proposed action can be expected to be adverse, long-term and negligible to minor.

4.6.2 Alternative 2: No Action

Under the No Action Alternative, risks from accidents, exposure to process gases as well as to air emissions throughout the construction process would not occur. Any emissions released from the PSDF from alternative research projects can be expected to be at the level they're at now, or less, with the addition of efficiency upgrades. The overall impacts to human health from the No Action Alternative can be expected to be negligible.

4.7 CULTURAL RESOURCES

4.7.1 Alternative 1: Proposed Action

Consultation regarding the Proposed Action was initiated with the Alabama State Historic Preservation Officer (SHPO) on June 2, 2008. On June 27, 2008, the Alabama Deputy SHPO sent a reply letter stating that "the project activities will have no effect on any known cultural resources listed on or eligible for the National Register of Historic Places". A full copy of this response letter can be found in **Appendix B**. It is anticipated that the proposed project would not result in any impacts to cultural or historic resources, as no previously undisturbed land would be developed.

Should any item of potential archaeological significance be discovered, however, during development of the sites to be used for the CRC CO_2 capture R&D efforts, the SHPO would be notified immediately. If any historically or culturally significant materials or artifacts were to be unearthed, activities would halt immediately and not resume until consultation with the SHPO has been completed, in accordance with 36 CFR 800.13. With the understanding that the preceding steps would be taken, and that the potential for the discovery of any significant cultural resources is extremely low, it is anticipated that no impacts to cultural resources would occur.

4.7.2 Alternative 2: No Action

Under the No Action Alternative, no new areas of the PSDF or Plant Gaston Unit 5 would be developed as part of the CRC, and as a result, no impacts are anticipated to occur to cultural or historic resources.

4.8 SOCIOECONOMICS

The threshold level of significance for socioeconomic resources is the potential of the project to result in a substantial population or employment increase or decrease in the region of influence.

4.8.1 Alternative 1: Proposed Action

As PSDF's mission is changed to that of PSDF-CRC, and as new R&D efforts are designed and implemented as part of the Proposed Action, changes to the number of design and construction personnel will occur on a temporary basis. However, any increases would not be different than historical employment levels at the PSDF, when larger projects have been implemented. Historically PSDF has employed approximately 32 construction workers at any one time for normal workload. This number has increased to approximately 70 construction workers during peak construction periods. No change is expected for the various construction phases of the CRC. Therefore, it is expected the temporary workforce population would vary from approximately 30 to approximately 70. The initial construction work for the CRC would last approximately 3 months and future construction phases would last approximately 3 months as well.

The implementation of the Proposed Action would also result in the hiring of up to 10 full-time process engineers and systems operators for the 5 year project period. This slight increase in employment levels may have a slight, beneficial impact on area socioeconomics. Overall impacts to socioeconomics from the implementation of the Proposed Action are expected to be beneficial and minimal. Employment levels are anticipated to be within the typical fluctuation of workforce numbers seen at this site.

4.8.2 Alternative 2: No Action

It is not known at this time whether or not cancellation of the CRC project would translate into potential site layoffs. If any layoffs were to occur, the impacts from the No Action alternative would be adverse and in proportion to the scaledown of the site's workforce. Additionally, the No Action alternative would not have the benefits of potentially developing more cost-effective and affordable CO_2 capture technology, which could ultimately result in widespread beneficial economic impacts to coal based power generation facilities which seek to reduce their CO_2 emissions.

4.9 CUMULATIVE IMPACTS

CEQ regulations (40 CFR 1508.7) require an analysis of the cumulative impacts resulting from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of who undertakes these other actions. Cumulative impacts can result from individually minor, but collectively significant, actions. This cumulative impacts section of the EA addresses only the cumulative effects arising from considering the Proposed Action in combination with other ongoing actions at, or in the vicinity of, the PSDF and Plant Gaston.

No development, with the exception of what has been disclosed within this EA as part of the CRC, is proposed to take place at the PSDF within the foreseeable future. The only developments proposed at Plant Gaston are a new limestone processing plant and a new air siren system. Cumulatively, the impacts of implementing the Proposed Action at Plant Gaston, in conjunction with the other developments proposed there, are considered negligible.

In a regional context, the greater Wilsonville area is experiencing a slight increase in population and growth, and it can be expected that there will be some amount of new development taking place in the region in the foreseeable future. However, the development impacts of the CRC are minimal, as less than one acre of previously disturbed land is proposed to be developed. As a result, no cumulative impacts to land use, or to soils and geology, are anticipated to result within a regional context.

Water quality in both major surface waterbodies adjacent to the PSDF and Plant Gaston sites, the Yellowleaf Creek and the Coosa River, are currently impaired. TMDLs developed for the waterbodies address the lack of DO by putting restrictions on new sources of ammonia and oxygen-depleting nutrients in the waterbodies, and, they address the elevated level of PCBs by restricting new sources of PCBs. The proposed project is not anticipated to contribute new or elevated sources of substances that decrease the DO or elevate the PCB concentrations in the waterbodies. However, continued operation and discharge of various process waters and wastewaters from both the PSDF and Plant Gaston facilities continues to pose a threat to water quality in the vicinity of the project area. Conversely, continued operation of the intake structure provides important habitat for a federally endangered species that requires turbulent waters for survival, in an area which has been so extensively hydrologically modified that almost no free flowing conditions of the Coosa River exist near the project site. As a result of the incremental contribution of water intake and discharge from the facility operation proposed under this action, both long-term minute adverse and beneficial cumulative impacts to water resources and biological resources would result, respectively.

On an airshed level, the State of Alabama takes into account the effects of all past, present, and reasonably foreseeable emissions during the development of the SIP. The State of Alabama accounts for all significant stationary, area, and mobile emission sources in the development of this plan. Estimated emissions generated by the Proposed Action would be *de minimis* and would not be regionally significant. Therefore, it is not anticipated that the Proposed Action would contribute significantly to adverse cumulative effects to air quality. On an even larger scale, the proposed project has the potential to contribute long-term, major beneficial impacts towards the future reduction of domestic and global CO_2 emissions by providing key R&D activities in the efforts to develop cost-effective and efficient CO_2 capture technology.

4.10 MITIGATION MEASURES

All future actions proposed as part of this project should employ the following mitigation measures to ensure that environmental impacts from construction and operation of the project are minimized to the greatest extent possible. Adherence to the following mitigation measures, in conjunction with adherence to all applicable and appropriate local, state, and federal regulations and permits, should ensure that the development and operation of the PSDF-CRC has no significant impacts to the environment.

Soil

- Incorporate and maintain BMPs at all construction sites; BMPs typically consist of various erosion and sediment control measures such as silt fences, straw bales, and other temporary measures to be placed in ditches and along portions of the

site perimeter to control erosion during construction activities. These temporary erosion prevention measurements should be maintained in place until the site vegetation is firmly established and soil has stabilized. Regular inspections of the erosion and sediment control measures should be performed after any storm event.

- Store and maintain all fuels in a designated equipment staging area to reduce the potential for soil contamination. Closely monitor the fueling operation, and have an emergency spill kit containing absorption pads, absorbent material, a shovel or rake, and other cleanup items, readily available on site in the event of an accidental spill.

Water Resources

- Place erosion control structures around construction site perimeters during all construction and demolition activities. To the extent practicable, sediment runoff from the site should be captured and prevented from entering area surface water bodies.

Air Quality

- Continue to implement reasonable measures, such as applying water to exposed surfaces or stockpiles of dirt, when windy and/or dry conditions promote problematic fugitive dust emissions. Adhering to these BMPs would minimize any fugitive dust emissions.

Waste Management

- Continue to recycle and/or reuse as many materials as possible during the construction and operation phases of the project in order to minimize the amount of waste generated by the facilities. All hazardous waste and materials stored and/or generated at the development should be properly and uniformly labeled and housed in appropriate storage facilities.

5.0 LIST OF PREPARERS

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APPENDIX A

AIR EMISSIONS CALCULATIONS

Construction Emissions

Table A-1. Heavy Equipment

Construction Equipment Use

Equipment Type	Number of Units	Days on Site	Hours Per Day	Operating Hours
Excavators Composite	2	60	7	840
Rubber Tired Dozers Composite	1	60	7	420
Graders Composite	1	60	7	420
Trenchers Composite	1	60	7	420
Concrete/Industrial Saws Composite	1	30	7	210
Plate Compactors Composite	2	60	7	840
Air Compressors	2	90	4	720
Cement and Mortar Mixers	2	90	7	1260
Cranes	1	120	7	840
Generator Sets	2	180	7	2520
Tractors/Loaders/Backhoes	2	180	7	2520
Paving Equipment Composite	1	30	7	210
Pavers Composite	1	30	7	210

Construction Equipment Emission Factors (lbs/hour)

Equipment	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Excavators Composite	0.5828	1.3249	0.1695	0.0013	0.0727	0.0727	119.6
Rubber Tired Dozers Composite	1.5961	3.2672	0.3644	0.0025	0.1409	0.1409	239.1
Graders Composite	0.6561	1.6191	0.1936	0.0015	0.0840	0.0840	132.7
Trenchers Composite	0.5080	0.8237	0.1851	0.0007	0.0688	0.0688	58.7
Concrete/Industrial Saws Composite	0.4411	0.7263	0.1460	0.0007	0.0610	0.0610	58.5
Plate Compactors Composite	0.0263	0.0328	0.0052	0.0001	0.0021	0.0021	4.3
Air Compressors	0.3782	0.7980	0.1232	0.0007	0.0563	0.0563	63.6
Cement and Mortar Mixers	0.0447	0.0658	0.0113	0.0001	0.0044	0.0044	7.2
Cranes	0.6011	1.6100	0.1778	0.0014	0.0715	0.0715	128.7
Generator Sets	0.3461	0.6980	0.1075	0.0007	0.0430	0.0430	61.0
Tractors/Loaders/Backhoes	0.4063	0.7746	0.1204	0.0008	0.0599	0.0599	66.8
Paving Equipment Composite	0.4616	0.9857	0.1479	0.0008	0.0681	0.0681	69.0
Pavers Composite	0.5874	1.0796	0.1963	0.0009	0.0769	0.0769	77.9

Source: CARB, 2007.

Construction Equipment Emissions (tons)

Equipment	CO	NO_x	VOC	SO_x	PM_{10}	$PM_{2.5}$	CO_2
Excavators Composite	0.2448	0.5565	0.0712	0.0006	0.0305	0.0305	50.2241
Rubber Tired Dozers Composite	0.3352	0.6861	0.0765	0.0005	0.0296	0.0296	50.2122
Graders Composite	0.1378	0.3400	0.0406	0.0003	0.0176	0.0176	27.8761
Trenchers Composite	0.1067	0.1730	0.0389	0.0001	0.0145	0.0145	12.3315
Concrete/Industrial Saws Composite	0.0463	0.0763	0.0153	0.0001	0.0064	0.0064	6.1387
Plate Compactors Composite	0.0111	0.0138	0.0022	0.0000	0.0009	0.0009	1.8118
Air Compressors	0.1361	0.2873	0.0444	0.0003	0.0203	0.0203	22.8986
Cement and Mortar Mixers	0.0282	0.0414	0.0071	0.0001	0.0028	0.0028	4.5663
Cranes	0.2525	0.6762	0.0747	0.0006	0.0300	0.0300	54.0402
Generator Sets	0.4361	0.8795	0.1354	0.0009	0.0542	0.0542	76.8508
Tractors/Loaders/Backhoes	0.5120	0.9759	0.1517	0.0010	0.0754	0.0754	84.1760
Paving Equipment Composite	0.0485	0.1035	0.0155	0.0001	0.0072	0.0072	7.2398
Pavers Composite	0.0617	0.1134	0.0206	0.0001	0.0081	0.0081	8.1833
Total Equipment Emissions	**2.3568**	**4.9228**	**0.6941**	**0.0046**	**0.2975**	**0.2975**	**406.5493**

Table A-2. Painting

VOC Content	1.25	lbs/gallon	
Coverage	400	sqft/gallon	
Emission Factor	0.003125	lbs/sqft	
Building/Facility	Wall Surface	VOC [lbs]	VOC [tons]
Gas Analyzer Building	4500	14.1	0.0070
Total	**4500**	**14.1**	**0.0070**

Table A-3. Transportation of Concrete

Volume of Concrete (Cubic Yards)	538.9			**Pad 1**	**Pad 2**	**Pad 3**	Pad 4
Truck Capacity (Cubic Yards)	10		**Length**	20	30	50	50
Number of Deliveries	54		**Width**	40	15	50	150
Number of Trips	2		**Depth**	2	1	5	50
Miles Per Trip	30		**Volume**	59.3	16.7	463.0	
Total Miles	3233.3						
Pollutant	**CO**	**NO_x**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Emission Factor (lbs/mile)	0.0136	0.0446	0.0035	0.0000	0.0022	0.0019	4.2
Total Emissions (lbs)	44.02	144.14	11.37	0.13	6.97	6.14	13650.6
Total Emissions (tons)	**0.0220**	**0.0721**	**0.0057**	**0.0001**	**0.0035**	**0.0031**	**6.8**

Source: CARB, 2007.

Table A-4. Delivery of Equipment and Supplies

Number of Deliveries	2						
Number of Trips	2						
Miles Per Trip	30						
Days of Construction	230						
Total Miles	27600						
Pollutant	**CO**	**NO_x**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Emission Factor (lbs/mile)	0.0219	0.0237	0.0030	0.0000	0.0009	0.0007	2.7
Total Emissions (lbs)	605.80	654.47	82.60	0.71	23.63	20.41	75056.4
Total Emissions (tons)	**0.3029**	**0.3272**	**0.0413**	**0.0004**	**0.0118**	**0.0102**	**37.5**

Source: CARB, 2007.

Table A-5. Worker Commutes

Number of Workers	20						
Number of Trips	2						
Miles Per Trip	30						
Days of Construction	230						
Total Miles	276000						
Pollutant	**CO**	**NO_x**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Emission Factor (lbs/mile)	0.0105	0.0011	0.0011	0.0000	0.0001	0.0001	1.1
Total Emissions (lbs)	2911.37	304.40	297.86	2.97	23.48	14.61	303470.9
Total Emissions (tons)	**1.4557**	**0.1522**	**0.1489**	**0.0015**	**0.0117**	**0.0073**	**151.7**

Source: CARB, 2007.

Table A-6. Total Construction Emissions (tons)

Activity/Source	**CO**	**NO_x**	**VOC**	**SO_x**	**PM_{10}**	**$PM_{2.5}$**	**CO_2**
Construction Equipment	2.3568	4.9228	0.6941	0.0046	0.2975	0.2975	406.5
Painting	0.0000	0.0000	0.0070	0.0000	0.0000	0.0000	0.0
Transportation of Concrete	0.0220	0.0721	0.0057	0.0001	0.0035	0.0031	6.8
Delivery of Equipment and Supplies	0.3029	0.3272	0.0413	0.0004	0.0118	0.0102	37.5
Worker Commutes	1.4557	0.1522	0.1489	0.0015	0.0117	0.0073	151.7
Total Construction Emissions	**4.1374**	**5.4743**	**0.8971**	**0.0065**	**0.3245**	**0.3181**	**602.6**

Operational Emissions

The tables below show the potential emissions calculations and the actual emissions calculations from 2003 through 2007 for Nitrogen Dioxide, Sulfur Dioxide, Carbon Monoxide, Particulate matter, and Volatile Organic Compounds (VOC). The calculations are based on emission factors obtained from air compliance testing for the respective years shown in Table A-7. The actual emissions are shown in Table A-9. The average of the Emission Factors was then used to calculate potential emissions shown in Table A-8. Based on the average emission factors for each of the respective pollutants, Nitrogen Dioxide and Sulfur Dioxide potential to emit exceeds the 100 tons per year threshold. Therefore the facility must submit a permit application for a major source. However, the facility could opt for a Synthetic Minor Operation Permit (SMOP) should it elect to take restrictions to keep Sulfur Dioxide and Nitrogen Dioxide below the 100 tpy thresholds. The PSDF has elected not to apply for the SMOP even though the reduced hours of operations over the past five years show a trend that could support the SMOP.

Table A-7. Five Year Hourly Emission Rates in Pounds per Hour for NO_2, SO_2, CO, PM, and VOCs, 2003 through 2007 and Five Year Average

Pollutant	2003	2004	2005	2006	2007	Total	Five Year Average
NO_2	15.5	21.6	26.7	19.4	32.9	116.1	23.2
SO_2	21.8	17.3	11.9	16.3	18.6	85.9	17.2
CO	0.1	0	0	0.1	0	0.20	0.04
PM	6.1	4.2	0.3	1.1	0.3	12.0	2.4
VOC	0.1	0	2.0	0	1.2	3.3	0.7

Table A-8. Five Year Emission Summaries in Tons per Year, 2003 through 2007 and Five Year Average

Pollutant	2003	2004	2005	2006	2007	Total	Five Year Average
NO_2	23.3	16.1	23.7	14.7	12.3	90.1	18.0
SO_2	14.7	14.7	10.9	7.9	8.5	56.7	11.3
CO	0.03	0.22	0	0.03	0.03	0.4	0.08
PM	3.2	3.7	0.5	0.4	0.4	12.8	2.6
VOC	0.06	0.02	1.7	0.8	0.1	2.6	0.5

Table A-9. Potential Total Facility Emissions versus Actual Total Facility Emissions in Tons per Year

	KBR Process		Alternate (Foster Wheeler) Process		Total Facility5	
Pollutant	**Potential** [1]	**Actual** [2]	**Potential** [3]	**Actual** [4]	**Potential**	**Actual**
NO_2	101.6	18.0	86.3	0	187.9	18.0
SO_2	75.3	11.3	47.7	0	123.0	11.3
CO	0.2	0.06	0.9	0	1.1	0.06
PM	10.5	1.6	8.8	0	19.3	1.6
VOC	3.1	0.5	0	0	3.1	0.5

1. Potential KBR process emissions are calculated from average emission factors from compliance tests from 2003 to 2007:

   NO_2 = 23.2 lbs/hr x 24 hr/day x 365 days/yr x 1 Ton/2000 lbs = 101.6
   SO_2 = 17.2 lbs/hr x 24 hr/day x 365 days/yr x 1 Ton/2000 lbs = 75.3
   CO = 0.04 lb/hr x 24 hrs/day x 365 days/yr x 1 Ton/2000 lbs = 0.2
   PM = 2.4 lbs/hr x 24 hrs/day x 365 days/yr x 1Ton/2000 lbs = 10.5
   VOC = 0.7 lb/hr x 24 hrs/day x 365 days/yr x 1 Ton/2000 lbs = 3.1

2. The KBR process actual annual emissions are the average annual emissions from 2003 to 2007.
3. During one particular compliance test, syngas was produced in the KBR gasifier and sent to the combustion turbine. These emissions are used as representative of the alternate (Foster Wheeler) process had it operated :

   NO_2 = 19.7 lbs/hr x 24 hrs/day x 365 days/yr x 1 Ton/2000 lbs = 86.3
   SO_2 = 10.9 lbs/hr x 24 hrs/day x 365 days/yr x 1 Ton/2000 lbs = 47.7
   CO = 0.2 lb/hr x 24 hrs/day x 365 days/yr x 1 Ton/2000 lbs = 0.9
   PM = 2.0 lbs/hr x 24 hrs/day x 365 days/yr x 1 Ton/2000 lbs = 8.8
   VOC = 0 lbs/hr x 24 hrs/day x 365 days/yr x 1Ton/2000 lbs = 0

4. The Foster Wheeler process was not operated.
5. Total facility emissions are the sum of KBR process emissions and alternate process emissions.

APPENDIX B

AGENCY CORRESPONDENCE

Jun 24 2008 11:43AM USFWS 251-441-6222 p.1

2008-TA-0570 WMTA/TM

THE MANGI ENVIRONMENTAL GROUP, INC.
7915 Jones Branch Dr. McLean VA 22102
703 760 4801 Fax 703 760 4899
www.mangi.com

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Viet Nam Veteran Owned

June 2, 2008

Bill Pearson, Field Supervisor
Daphne Ecological Services Field Office
U.S. Fish and Wildlife Service
1208-B Main Street
Daphne, AL 36526

Post-It® Fax Note 7671 | Date 6/24/08 | # of pages 2
To A. M. Lundin | FROM: Sandy M
Co./Dept. Mangi | Co.: USFWS
Phone # | Phone #: 251-441-5184
Fax # 703-760-4899 | Fax#: 251-441-6222

Dear Mr. Pearson:

The United States Department of Energy, National Energy Technology Laboratory (DOE/NETL) is preparing an Environmental Assessment (EA) to evaluate the proposed Carbon Research Center (CRC) project to be located at the existing Power Systems Development Facility (PSDF) plant near Wilsonville in Shelby County, Alabama. A small component of the CRC project would be located at the adjacent E.C. Gaston Generating Plant (*please reference enclosed maps*). The DOE/NETL has hired our firm to conduct the Environmental Assessment, and to assess the potential environmental, social, and cultural impacts attributable to the proposed project. We are soliciting your comments and concerns about potential impacts to wildlife or vegetation within, or in the vicinity of, the project area.

The PSDF is a facility designed and built to evaluate advanced coal-based power technologies at a scale large enough to provide meaningful data for scale-up and under conditions that would adequately represent temperature, pressure, and contaminant conditions of a commercial embodiment. Operation of the PSDF was initiated September 14, 1990, and is currently set to expire on September 30, 2008. However, research and development efforts at the PSDF, in the form of the CRC, are proposed for another 5-year period.

The initial EA for the development, construction, and operation of the PSDF was issued with a Finding of No Significant Impact (FONSI) in 1993. The proposed action currently being evaluated is for DOE to provide, through a 60-month cooperative agreement with Southern Company Services, Inc., financial assistance for the proposed development of the CRC Project at the PSDF plant. If approved, DOE would provide project assistance to test components and advanced power systems, including carbon (in the form of CO_2) capture technology, under realistic conditions using coal-derived gas streams.

No major modifications to existing operational permits for the PSDF are anticipated to be required as a result of the implementation of this action. No previously undisturbed ground would be developed. The project would primarily involve the installation of new components on existing facilities in order to research and develop carbon capture technologies, and, the continued operation of the PSDF facility for a period of 5 years.

Jun 24 2008 11:43AM USFWS 251-441-6222 p.2

2008-TA-0570

We request that you provide any information, issues, or concerns regarding the resources under your jurisdiction, per Section 7 of the Endangered Species Act, on or in the vicinity of the subject property by July 2, 2008. Please inform us of any current federally listed threatened or endangered species, species of concern, or any other special status species that might occur in the project area, and any designated critical habitats that may be present for these species. Please submit your comments or data resources to:

Roy G. Spears
NEPA Document Manager
National Energy Technology Laboratory
U.S. Department of Energy
3610 Collins Ferry Road
Morgantown, WV 26505

Comments can also be submitted by email (roy.spears@netl.doe.gov) or fax (304-285-4403). We look forward to your prompt response. Your assistance in this effort is greatly appreciated.

Sincerely,

Anna M. Lundin
Project Manager
Mangi Environmental Group

U.S. Fish and Wildlife Service
1208-B Main Street – Daphne, Alabama 36526
Phone: 251-441-5181 Fax: 251-441-6222

No federally listed species/critical habitat are known to occur in the project area. As described, the project will have no significant impact on fish and wildlife resources. IF PROJECT DESIGN CHANGES ARE MADE, PLEASE SUBMIT NEW PLANS FOR REVIEW. We recommend use of best management practices specific to your project (See http://www.fws.gov/daphne/section7/bmp.html).

William J. Pearson, Field Supervisor 6/24/08 Date #3

STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
468 SOUTH PERRY STREET
MONTGOMERY, ALABAMA 36130-0900

FRANK W. WHITE
EXECUTIVE DIRECTOR

TEL: 334-242-3184
FAX: 334-240-3477

June 27, 2008

Anna M. Lundin
MANGI Environmental Group
7915 Jones Branch Drive
McLean Virginia 22102

Re: AHC 08-0852
Carbon Research Center
E. C. Gaston Generation Plant
Shelby County, Alabama

Dear Ms. Lundin:

Upon review of the above referenced project, we have determined that the project activities will have no effect on any known cultural resources listed on or eligible for the National Register of Historic Places. Therefore, we concur with the proposed project activities.

However, should artifacts or archaeological features be encountered during project activities, work shall cease and our office shall be consulted immediately. Artifacts are objects made, used or modified by humans. These include but are not limited to arrowheads, broken pieces of pottery or glass, stone implements, metal fasteners or tools, etc. Archaeological features are stains in the soil that indicate disturbance by human activity. Some examples are postholes, building foundations, trash pits and even human burials. This stipulation shall be placed on the construction plans to insure contractors are aware of it.

We appreciate your efforts on this project. Should you have any questions, the point of contact for this matter is Greg Rhinehart at (334) 230-2662. Please have the AHC tracking number referenced above available and include it with any correspondence.

Truly yours,

Elizabeth Ann Brown
Deputy State Historic Preservation Officer

EAB/GCR/gcr

THE STATE HISTORIC PRESERVATION OFFICE
www.preservealа.org

APPENDIX C

NOTICE OF AVAILABILITY

AFFIDAVIT OF PUBLICATION

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U.S. DEPARTMENT OF ENERGY PUBLIC NOTICE
The U.S. Department of Energy's National Energy Technology Laboratory has prepared a Draft Environmental Assessment (EA) which analyzes the potential environmental impacts of providing funding for the proposed Carbon Research Center (CRC) project to be located at the existing Power Systems Development Facility (PSDF) owned and operated by Southern Company Services, Inc. near Wilsonville, Alabama. The CRC would be designed to test and evaluate carbon dioxide (CO_2) control technologies for power generation facilities. The project would primarily involve the installation of new components on existing facilities in order to research and develop carbon capture technologies, and, the continued operation of the PSDF facility for a period of 5 years. Copies of the Draft EA are available for review through the Harrison Regional Library System, at the PSDF facility, or copies may be requested by phone at 304-285-5460, electronically at roy.spears@netl.doe.gov, or in writing from Roy Spears, Document Manager; National Energy Technology Laboratory; U.S. Department of Energy; 3610 Collins Ferry Road, (P.O. Box 880); Morgantown, WV 26507-0880. Any comments on the Draft EA should be received by close of the comment period, August 27, 2008.
BN: July 27,28,29, 2008

5003734

On this 29 day of JULY A.D. Two Thousand, and eight, Randy S. Crayne declares that he is the Billing Manager of "The Birmingham News" published in the City of Birmingham, in the County of Jefferson, in the State of Alabama, and that the advertisement, a true copy of which is herewith attached, appeared in "The Birmingham News" on the following dates:

JULY 27, 28, 29, 2008

Signed- Randy S. Crayne

State of Alabama
County of Jefferson

On 9-30, 2008, Randy S. Crayne personally appeared before me, who is personally known to me to be the signer of the above document, and he acknowledged that he signed it.

Eunice Spitzley Notary Public
My Commission Expires: January 23, 2012

Publisher's Certificate of Publication

STATE OF ALABAMA
SHELBY COUNTY

Personally appeared before me, the undersigned Notary Public, in and for said state and county, ***Tim Prince***, who, being duly sworn according to the law deposes and says that he is Publisher of the *Shelby County Reporter*, a newspaper published in said county, and the publication of a certain notice, a true copy of which is hereto affixed, has been made in said newspaper 1 week(s) consecutively, to-wit in issues thereof dated as follows:

30 day of July, 2008

___ day of _____, 2008

___ day of _____, 2008

___ day of _____, 2008

Publisher, *Shelby County Reporter*

Sworn to and subscribed before me this 30 day of July, 2008.

Notary Public, State of Alabama at large

My commission expires 05-02-2010

U.S. Department of Energy
Public Notice

The U.S. Department of Energy's National Energy Technology Laboratory has prepared a Draft Environmental Assessment (EA) which analyzes the potential environmental impacts of providing funding for the proposed Carbon Research Center (CRC) project to be located at the existing Power Systems Development Facility (PSDF) owned and operated by Southern Company Services Inc. near Wilsonville, Alabama. The CRC would be designed to test and evaluate carbon dioxide (CO2) control technologies for power generation facilities. The project would primarily involve the installation of new components on existing facilities in order to research and develop carbon capture technologies, and the continued operation of the PSDF facility for a period of 5 years.

Copies of the Draft EA are available for review through the Harrison Regional Library System, at the PSDF facility or copies may be requested by phone at 304-285-5469, electronically at ray.spears@netl.doe.gov or in writing from Ray Spears, Document Manager, National Energy Technology Laboratory, U.S. Department of Energy, 3610 Collins Ferry Road (P.O. Box 880), Morgantown, WV 26507-0880. Any comments on the Draft EA should be received by close of the comment period August 27, 2008.

Shelby County Reporter
July 30, 2008
PUB.N/WILSONVILLE

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