FINDING OF NO SIGNIFICANT IMPACT

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

AGENCY: U.S. Department of Energy (DOE)

ACTION: Finding of No Significant Impact (FONSI)

SUMMARY: Pursuant to Council on Environmental Quality regulations (40 CFR Parts 1500-1508) implementing the procedural provisions of the National Environmental Policy Act, the U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) has prepared an Environmental Assessment (EA), (DOE//EA–1616), for 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.

Based on the analysis in the EA, DOE finds that implementing the proposed action is not a major federal action that would significantly affect the quality of the human environment within the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969, as amended. Accordingly, the preparation of an Environmental Impact Statement (EIS) for this proposed action is not warranted and this FONSI will be issued.

COPIES OF THE EA ARE AVAILABLE FROM:

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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 research and development efforts have 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 research 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.

The PSDF is 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. 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 FONSI in 1993.

DESCRIPTION OF THE PROPOSED ACTION: The Proposed Action, providing funding for the implementation and operation of the 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 proposed action 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. DOE would provide project assistance to test components and advanced power systems. A small component of the CRC project, the post-combustion CO_2 capture component, would be located at the adjacent Alabama Power's Plant Gaston. 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 would provide the remaining 20% project cost.

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 Research and Development 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

<u>Pre-combustion CO_2 capture</u> relates to coal gasification plants, where fuel is converted into gaseous components by applying heat under pressure in the presence of steam. 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.

To gather information on the cost effectiveness of the tested technologies, all process blocks within the PSDF plant would 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 is primarily applicable to conventional coal-fired power generation, but may also be applied to gas-fired generation using combustion turbines. Post-combustion CO_2 capture as part of the CRC will be studied at the adjacent Plant Gaston's Unit 5, as Plant Gaston is a conventional pulverized coal fired plant. The post-combustion CO_2 capture research and development efforts 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. 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 would be installed adjacent to Unit 5 of the plant in a previously developed area. The total potential operating capacity of the 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.

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. 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.

Operating the Transport Combustor as a pressurized, circulating fluid bed combustor may provide a useful alternative to current oxy-combustion testing. 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.

ENVIROMENTAL CONSEQUENCES: Environmental consequences associated with both development and operations of the Proposed Action were considered in the EA. The main issue of concern examined in the EA was related to air quality as a result of continued operation of the PSDF for a period of 5 years.

Based on the facility's potential to emit air pollutants, the PSDF is a major emissions source which holds a current facility wide air permit, known as a Title V permit, issued by the Alabama Department of Environmental Management in October, 2003. The Title V PSDF air permit would not be affected by the proposed project. A modification or add-on to the existing facility air permit may be necessary, depending on selection of the technology to be tested. All air emissions from the development and operation activities of the CRC are expected to be below the applicability threshold for all criteria pollutants, and would not be regionally significant. It is anticipated that no increase in emission limits to the existing permit would be sought.

The proposed project components would be constructed on previously disturbed areas of the PSDF and Plant Gaston sites. Negligible impacts to geology and soils, water resources, biological resources, waste and hazardous materials management, and cultural resources would occur. Development and operation of the proposed project would not be expected to impact any Federal- or state-listed threatened or endangered species. No changes in noise levels or land use would be expected as a result of the proposed project. Minor economic benefits would be derived indirectly during construction of the project.

ALTERNATIVES CONSIDERED:

Proposed Action

DOE proposes 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 Action

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 the EA 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.

PUBLIC AVAILABILITY: DOE encourages public participation in the NEPA process. Comments were invited on the Draft EA for a period of 30 days after publication of the Notice of Availability in two local newspapers; *The Birmingham News* and the *Shelby County Reporter*. Copies of the Draft EA were also available through the Harrison Regional Library System at select locations chosen by the regional library director, and, at the PSDF facility. No comments were received by members of the public during the comment period. Agency comment letters which were received during the EA review period are summarized below.

On June 24, 2008, the United States Fish and Wildlife Service (USFWS) Daphne Ecological Services Field Office responded to a DOE Endangered Species Act Section 7 consultation request stating that no federally listed species/critical habitat are known to occur in the project area, and, as described, the proposed project will have no significant impact on fish and wildlife resources.

On June 27, 2008, the Alabama State Historical Commission stated that the project as proposed will have no effect on any known cultural resources listed on or eligible for the National Register of Historic Places and that the SHPO concurred with the proposed project activities. However, the SHPO also stipulated that should any artifacts or archaeological features be encountered during project activities, work shall cease and the State SHPO office will be contacted immediately.

The FONSI, and the EA on which it is based, will be distributed to all persons and agencies known to be interested in, or potentially affected by, the Proposed Action. Additional copies of the FONSI and the EA can be obtained from the National Energy Technology Laboratory at the address previously identified.

DETERMINATION:

Based upon the information and analysis provided in the EA, DOE has determined that the proposed federal action, to provide partial funding through a 60-month cooperative agreement with Southern Company Services, Inc., for the proposed development of the CRC Project at the PSDF plant, does not constitute a major federal action significantly affecting the quality of the human environment within the meaning of NEPA. Therefore, an EIS is not required and DOE is issuing this Finding of No Significant Impact.

ISSUED IN MORGANTOWN, WV, THIS 10 DAY OF SEPTEMBER, 2008

Carl O. Bauer
Director
National Energy Technology Laboratory