Finding of No Significant Impact
for
Biomass Cogeneration and Heating Facilities
at the
Savannah River Site

Agency: U.S. Department of Energy

Action: Finding of No Significant Impact

Summary: The Department of Energy (DOE) has prepared an environmental assessment (EA) (DOE/EA-1605) to analyze the potential environmental impacts of the proposed construction and operation of new biomass cogeneration and heating facilities located at the Savannah River Site (SRS). The draft EA was made available to the States of South Carolina and Georgia, and to the public, for a 30-day comment period. Based on the analyses in the EA, DOE has determined that the proposed action is not a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969. Therefore, the preparation of an environmental impact statement (EIS) is not required and DOE is issuing this finding of no significant impact (FONSI).

Public Availability: Copies of the final EA and FONSI or further information on the DOE NEPA process are available from:

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Background: A large portion of SRS (the F, H, and S-Areas) is supplied with its energy and steam from a coal-fired powerhouse in D-Area, while an oil-fired steam plant in K-Area supplies steam energy to both K and L-Areas. The coal-fired D-Area powerhouse was constructed in the 1950s and the K-Area oil-fired steam plant was installed in 1992. Both are in need of significant modifications to reliably supply energy for DOE's continuing missions and to meet current environmental regulations and air emission restrictions. In addition they represent significant overcapacity relative to current and projected needs. The project described in the EA will replace the two existing facilities with three biomass energy plants. Specifically, DOE's proposed action is the construction and operation of the following facilities: a new biomass cogeneration facility to replace the existing D-Area powerhouse; and two new biomass heating plants at K and L-Areas to replace the existing K-Area steam plant. The proposed biomass cogeneration facility and heating plants will supply energy to the F, H, K, L, and S-Areas

of SRS. The proposed project will help SRS meet its energy requirements for an initial term of 21 years, with the potential for many years of continued operation after the initial term.

The project is being proposed under the authority and terms of the DOE Biomass and Alternate Methane Fuel Energy Savings Performance Contract number DE-AC26-02-NT41457. DOE anticipates the proposed project will create significant energy and energy cost (dollar) savings to SRS. The savings will result from fuel switching, reductions in line losses by placing the steam plants several miles closer to end user facilities, and improved operations with new equipment that is sized to better match load requirements. In addition to providing for much of SRS's steam needs with a renewable energy source, the project will create benefits to the surrounding area. All three plants will utilize biomass obtained from the region, and will use the best available control technology for the reduction of air emissions.

Purpose and Need for Agency Action: The purpose of the proposed action is to supply large portions of SRS with reliable and efficient sources of energy. DOE needs to generate energy to support continuing and future SRS missions through more efficient and environmentally preferable means. DOE needs to utilize biomass and bio-derived fuels as fuel sources to move towards meeting requirements set forth in the Energy Policy Act of 2005, Public Law 109-58, which directs all Federal agencies to increase their renewable energy use, with a goal of using (1) 3 percent or more renewable energy in Fiscal Year (FY) 2007 through 2009, (2) 5 percent or more renewable energy in FY 2010 through 2012, and (3) 7.5 percent or more renewable energy by FY 2013.

Proposed Actions: The proposed action, the construction and operation of biomass cogeneration and heating facilities at SRS, will consist of the following two Energy Conservation Measures (ECMs): a new biomass cogeneration facility to replace the existing coal-fired D-Area powerhouse; and two new biomass heating plants, one in K-Area and one in L-Area to replace the existing oil-fired steam plant in K-Area. The ECM project components are described in detail below.

The proposed biomass cogeneration facility (EMC 1) will be located on a 30-acre site near the center of SRS. The facility will produce approximately 850,000,000 pounds of steam per year which will be exported to the 200-Area users and will meet all of the thermal energy steam requirements of the F, H, and S-Areas of SRS. The facility will also produce from 6 to 15 megawatts of electricity which will be connected and distributed to the SRS electrical distribution system for use onsite. Electricity output will vary based on the quantity of excess steam available after the steam load requirements are met.

Biomass fuel will be burned in the new facility to produce steam and power. The biomass will consist of primarily low-value wood residues and wood waste by-products with a small percentage of biomass-derived fuel (BDF) and oil delivered from the local Aiken and Augusta area. Biomass sources may include low-value forest products, forest residues and wood processing waste by-products, agricultural crops, construction waste, and alcohol fuels. Wood is the most common form of biomass and is available from

several waste sources. This material includes by-products from manufacturers such as furniture mills, saw mills, paper mills and other wood product manufacturers; low-value forest products, such as small trees and top wood, and defective or deformed trees; forest residues, such as dead wood and hazardous wildland fire fuels and landscaping waste. Woodwaste is typically in the form of sawdust, woodchips, pellets, and wood scraps such as crates and pallets, and is regularly used as an energy source for heating and power generation. There are numerous sources of biomass available within 100 miles of SRS and the fuel will be procured through purchases from local biomass suppliers. Many of the local suppliers obtain a portion of their biomass through timber sales from SRS.

BDF will make up to 30 percent of the heat input source for the cogeneration facility. The BDF will consist of tire-derived fuel (TDF) from scrap tires brought to transfer stations and landfills. The maximum permitted amount of BDF processed in the proposed facility will be approximately 1.1 million British thermal units (mbtu)/year or 43,000 tons of tires/year. In addition, each biomass boiler will be capable of burning fuel oil in the event the biomass feed system fails. As fuel oil is used, the biomass consumption will decrease. Five percent of the fuel input for the proposed cogeneration facility could be fuel oil. This consumption will vary as it will be a backup fuel only.

The biomass fuel delivery trucks will enter SRS using an existing primary road to the plant entrance. A deceleration lane will be added for trucks to enter the cogeneration facility as part of this project. Once onsite, the trucks will be unloaded using a truck dumper. A fire suppression system will be part of the cogeneration biomass fuel storage area. The trucks will exit behind the cogeneration facility where a new traffic light will be installed. The current graveled road will be paved to support the biomass truck deliveries. Peak truck traffic will be an 8 hour operation with 7 to 8 trucks per hour, 5 days per week.

The proposed cogeneration facility will include two 120,000 pounds per hour (pph) (210,000 mbtu/hr input) boilers and one 20 megawatt turbine. Each boiler will have full capacity fuel-oil burners that will serve as a back-up in case the biomass fuel system is inoperable. The proposed facility will have a footprint of approximately 20,000 square feet (sf), with an additional 2,200 sf administration building in front of the facility, a detached garage, and biomass fuel yard covering approximately 12 acres. The development on the site will include four main components: 1) the fuel handling yard, 2) the steam/combustion system, 3) the water treatment system, and 4) the turbine and electrical system. The 850 pounds per square inch (psi) steam produced by the steam plants will pass through a single extraction turbine. Steam required by SRS will then be transferred to an existing steam distribution system, and the remaining steam will flow through the other stage of the turbine for additional power generation. The combustion/steam system will include the components from the fuel feeder to the exhaust stack and the steam auxiliaries.

A bubbling fluidized bed (BFB) combustion technology is proposed for this project. BFB technology uses high pressure air to fluidize a 2-3 foot bed of sand (inert material) in suspension. The fuel source is fed into the system through air spouts and dropped onto

the bed. The system operates using air to reduce the bed temperature and to minimize nitrogen oxide (NOx) emissions. BFB technology is preferable to the circulating fluidized bed (CFB) for biomass fuels due to its ability to better tolerate various fuel types, as well as larger variations in both fuel mixture density and moisture content. BFBs have the advantage of reduced air emissions due to a more stringently controlled temperature in the combustion process. The BFB boiler will produce steam at 850 psi, 825° F. The steam will pass through a condensing steam turbine when generating electricity, or, if the turbine is down, through a pressure reducing valve (PRV) station which will reduce the pressure to 385 psi. The 385 psi steam will be distributed to the existing system via the interconnection to the existing steam header located just across an existing road from the new plant.

Each boiler will include a flue gas handling system, which will consist of an induced draft (ID) fan to pull the boiler flue gas through the economizer, and then through a multiple cone dust collector. The ID fan will exhaust into a fabric filter baghouse and then to an integral exhaust stack. The baghouse will capture particulate matter from the flue gas with removal efficiencies of 99.9+ percent. Because of the lower bed temperature of a BFB, a baghouse will be used instead of an electrostatic precipitator (ESP). The baghouse will be more effective in capturing sulfur and mercury components and has minimal energy requirements compared to the ESP. The flue gas will then exit through a stack adjacent to the ID fan and baghouse, to be located just outside of the new facility. The flue gas from the boiler will be treated in the combustion system using selective non-catalytic reduction (SNCR) technology to reduce nitrogen oxides. Urea will be injected into the furnace typically above the over-fire air ports, reacting with the oxides to form innocuous nitrogen and hydrogen.

Cooling process water for the facility will be drawn from the Savannah River. New more efficient pumps will be installed in the 681-3G Pumphouse to provide the water to the biomass cogeneration facility. A new pipeline will be installed from the proposed facility site to the nearest water main pump house in C-Area, a distance of approximately 1.5 miles. Of this distance, the pipeline will follow an existing right-of-way (ROW) for one mile and will then branch off for 0.5 miles through forested land. Industrial wastewater from the facility will be discharged via a discharge system to Upper Three Runs (UTR). The ash and other waste generated during facility operations will be disposed of at the nearby permitted Three Rivers Regional Municipal Solid Waste Landfill. A new electrical feeder line will be constructed to tie the facility into the SRS electrical grid system at the 251-F substation.

Construction of the cogeneration facility is scheduled to begin in September 2008, and will continue for 2.5 years. A peak number of 200 construction workers will be required during the construction period. The facility will be online near the end of 2010, and will operate 24 hours per day for an initial term of 21 years, though the serviceable life of the facility will be over 30 years. Approximately 20 employees will be required for operation of the facility.

ECM 2 will consist of two new biomass heating plants; one will service K-Area and the other will service L-Area. The new K-Area plant will be adjacent to the existing oil-fired steam plant within the fenced area. The L-Area plant will be located on the footprint of Building 183-4L which was removed during site decommissioning and demolition. Both plants will consist of a combustion and steam system. The plants will each be capable of producing 10,500 pounds per hour (pph) of steam. Additionally, both the K and L-Area biomass heating plants will only burn clean biomass and no BDF. The biomass fuel (wood materials) will be stored at the fuel yard adjacent to the proposed cogeneration facility (ECM 1), and will be trucked to the K and L-Area plants up to a maximum of one trip per day to both sites. The fuel will be loaded onto a walking floor-bed truck at the fuel yard and then parked at the metering bin for each steam plant. Each of the new plants will be installed in a new enclosed metal building with an adjacent covered shelter to house the fuel storage and delivery equipment. A fire suppression system will be part of each of the fuel storage areas. The total footprint of construction will be 3 acres for each steam plant, for a total of 6 acres. The total construction period for both plants will be approximately 18 months. Once operational, both plants will only produce steam, and will distribute the produced steam within their respective service areas (K and L). The pipeline connecting K-Area and L-Area will no longer be needed and will be capped and left in place. The plants at the K and L locations will each have less than 1400 gallons a day of steam blow down water at peak per plant. This water will drain to the existing sanitary sewer system in K-Area and to permitted outfall L-07 in L-Area.

Each of the two biomass plants will use up to 2,500 tons per year of biomass (5,000 tons total for both plants). The plants are scheduled to operate during the colder months of November through April. Each of the biomass plants will also be equipped with fuel oil burners for fuel oil combustion during system startup and backup. Up to about 5 percent of the plants' total fuel input could be fuel oil. Steam feed water will be supplied from the river water system in L-Area and from the well water system in K-Area.

No Action Alternatives: Under the No Action Alternative, DOE will continue to operate the coal-fired D-Area powerhouse, which produces both steam and electricity for onsite consumption, and the oil-fired K-Area steam plant, which produces only steam. These facilities are past their design life and are in need of significant modifications and upgrades to bring them into compliance with current environmental standards and permitting requirements. The existing D-Area powerhouse currently burns almost 160,000 tons of coal annually and will continue to use coal at a similar rate under the No Action Alternative. In FY 2007, 6,569 truckloads of coal were delivered to the D-Area powerhouse, totaling 153,954 tons of coal. On average, 26 truckloads were delivered to the site each day and the average weight of coal delivered per truckload was 23.4 tons.

The D-Area powerhouse is close to the Savannah River and is located several miles from its end users (F, H, and S-Areas) and must distribute steam through a large distribution pipeline to these areas, losing valuable energy in the process. In addition to steam, the powerhouse also produces approximately 20 megawatts of electricity on average that is consumed by DOE facilities onsite. Electricity output is based on the quantity of excess steam available after the steam load requirements are met. The D-Area powerhouse

withdraws an average of 50 million gallons of water per day from the Savannah River. Water that is used for steam plant feedwater is treated at the 483-D water plant. Untreated raw water, which is used for condenser cooling passes directly through the condenser and is discharged directly through the powerhouse's outfall. The primary National Pollutant Discharge Elimination System (NPDES) permitted outfall for the facility, D-01, discharges an average of 40.2 million gallons/day. Discharge limits are in effect for temperature, temperature difference between river water intake and discharge, residual chlorine, pH, total suspended solids, oil/grease, and manganese. The D-Area powerhouse employs 60 people and is operated by a contractor.

The existing oil-fired K-Area steam plant is maintained by SRS personnel, but no employees are permanently assigned to the facility. The K-Area steam plant consists of two boilers, one 30,000 pph and one 60,000 pph; the 30,000 pph steam plant has been and will continue to be the primary boiler. The K-Area steam plant serves both K and L-Area users, and a 2.5 mile pipeline delivers steam to the L-Area from K-Area. The steam that travels in this distribution pipeline also loses valuable energy before reaching L-Area. The source for process water for the K-Area plant will continue to be from the well water system in K-Area.

Alternatives Considered But Not Evaluated: For this project, two alternative locations were evaluated for the proposed biomass cogeneration facility, but were dismissed from further analysis. Alternative Site 1 is in close proximity to the main steam header, SC Highway 125, and a 115 kilovolts electrical system. Drawbacks to this location include the distance of the site from the F-Area production wells and the Central Sanitary Wastewater Treatment Facility (CSWTF). The major drawback to this site is the distance to the 200-Area end-users. This site is the closest of the evaluated locations to the existing powerhouse site. Therefore, compared to the other locations, more steam line would have to stay in service if this site were to be used. The cost of operating and maintaining this additional line would be considerable. The energy loss from transporting the steam across this distance would also be considerable. To compensate for this energy loss, more fuel would be needed. For these reasons, Alternative Site 1 was dismissed from further evaluation.

Alternative Site 2 is close to the 200-Area end-users and groundwater production wells. However, it is far from the highway, CSWTF, and the steam main. Because of the distance from a main SRS thoroughfare, this site location would create access difficulties for construction activities and fuel delivery. Further, the site is in close proximity to a remediated nuclear waste operations site. However, the key drawback of this site is that it is in close proximity to the H-Area meteorological tower and therefore would interfere with the tower's operation. For these reasons, Alternative Site 2 was dismissed from further evaluation.

DOE also considered alternatives related to water sources, the discharge of industrial effluent, and the cooling of process water, but did not evaluate them in the EA.

The biomass cogeneration facility would require process water for steam and cooling tower makeup and for backwash and regeneration cycles associated with the facility's water treatment system. Expected water flow demand could peak at 2,000 gallons per minute. Alternative sources of process water identified but not evaluated in the EA included: (a) treated effluent from CSWTF, (b) groundwater from existing F-Area production wells or new production wells installed at the preferred facility site, and (c) the SRS domestic water system. DOE determined that the CSWTF was not a viable water source because the volume of treated effluent would not be sufficient to meet facility needs. Although the site's groundwater resource could easily accommodate projected water demand, DOE determined the use of existing or new production wells would not be cost effective. From this analysis, DOE has determined the SRS domestic water system has sufficient capacity to support the proposed action, but its use for this purpose would not be economical. The biomass cogeneration facility will draw its water from the existing river water system. If, at some point in the future, the river water system is no longer available due to insufficient river flows, the above water source alternatives will be reevaluated.

A potential alternative to discharging industrial effluent (steam and cooling tower blow down) to UTR is to discharge this waste stream to CSWTF. DOE determined that the site's wastewater treatment facility could not accommodate the increased inflow, and this option was not evaluated in the EA. The use of air-cooled condensers as an alternative to the construction and operation of cooling towers was also identified. However, air-cooled condensers are space and energy intensive and will not function effectively during the hot and humid summer period. Therefore, DOE did not evaluate this alternative method for cooling process water in the EA.

Environmental Impacts: The cogeneration facility site will be located on an old abandoned borrow pit that appears to have had no restoration. The soil is highly disturbed and not characteristic of an intact series. Based on the previous use of the proposed site, the potential for the construction and operation of the proposed action to impact environmental resources at SRS will be negligible. DOE also expects that the potential for the utility line right-of-way construction to impact environmental resources at SRS will be negligible. DOE expects that environmental impacts from the construction and operation of the plants at K and L-Areas to be similar to those for the proposed facility site. As these two areas currently house facilities, the land and soils are already disturbed and compacted. DOE expects that the potential for the utility line right-of-way construction in K and L-Areas to impact environmental resources at SRS to be negligible. DOE expects no adverse water quality impacts from the construction and operation of the proposed actions. The substantial decrease in Savannah River water withdrawal rates will be beneficial.

DOE expects that air emissions resulting from construction-related activities (e.g., equipment emissions, fugitive dust) at the three sites will be short-lived and minimal. They will not require permitting by the State. Overall emissions will change with the shift from a coal-fired power plant to a biomass cogeneration facility. DOE expects the overall emission levels will decrease, but the emissions of some criteria pollutants will increase. SRS currently operates via a Title V-Part 70 Operating Permit. A new

operation permit will be obtained to include the new emissions from the cogeneration facility. Actions that will aid in decreasing the overall impacts of air emissions include limiting when the facility will be operating, and utilizing abatement technologies to help decrease emission levels at the source. The proposed facility's abatement measures include a fabric filter baghouse to reduce particulate matter (PM), and selective non-catalytic reduction (SNCR) to reduce nitrogen oxide formation. Baghouse filters work to curb PM emissions by trapping particulate matter in a fabric bag, similar to the way a vacuum cleaner operates. The filters are cleaned by blowing air through in the reverse direction and collecting the PM. This process effectively removes up to 99.9+ percent of particulate matter. The SNCR method effectively reduces NO_x emissions via a process of urea injection. Urea will be injected into the steam boiler at temperatures high enough to result in a chemical reaction between water and urea that forms ammonia which in turn reacts with NO_x and oxygen to form nitrogen and water. In addition, limestone will be injected into the flue gas and, via sorption reactions, reduce NO_x and sulfur compounds. Multicyclone technology will be implemented at the K and L-Area plants to aid in decreasing air emissions. This technology reduces the temperature of combustion by dilution of the combustion products with excess fuel, air, flue gas, or steam. The resulting chemical reactions prevent the majority of the nitrogen from becoming ionized and forming NO_x. Replacement of the existing facilities with biomass fueled facilities will substantially reduce greenhouse gas (e.g., water vapor, carbon dioxide, methane, ozone) emissions and minimize environmental compliance issues while more reliably providing steam for SRS missions and decreasing the SRS carbon footprint.

The potential for these activities to significantly impact the human environment (e.g., air, aquatic, terrestrial, and biotic resources) will be negligible. The potential for the proposed and alternative actions evaluated in the EA to significantly impact archaeological or cultural resources at SRS will be negligible. None of the proposed actions evaluated in the EA will be expected to have a measurable impact on migratory avian species. DOE expects overall impacts to both vegetation and wildlife to be long-term and minor for the proposed actions. There will be no effect on the population status of any threatened and endangered species within the proposed project areas or on a site wide level.

The potential for the proposed actions evaluated in the EA to result in terrorism-related activity or impacts at SRS are expected be negligible. The potential for the proposed actions evaluated in the EA to result in accidents from operation activities at SRS are expected to be negligible. Impacts to worker health and safety will be negligible due to the use of appropriate safety practices, personal protective clothing and equipment, and the provision of a safe and healthful workplace as required by Federal regulations. Workforce requirements and project costs of implementation of the proposed projects will be minimal when compared to the total SRS budget and employment (approximately $1.15 billion per year and 10,000 personnel, respectively). The socioeconomic impact(s) of the proposed projects on the human environment will be negligible. Based on the information and analysis presented in the EA, DOE has determined that the proposed construction and operation of the new biomass cogeneration

facility and heating plants at SRS will not cause disproportionately high and adverse human health or environmental effects on minority and low income populations in the SRS region of interest. Infrastructure impacts from the proposed actions will be negligible as the new facility and plants will be smaller than the existing powerhouse and therefore require less infrastructure resources.

Cumulative Impacts: Construction-related activities of implementation of the proposed projects will be short-lived and the potential for any resulting air emissions to interact with other SRS pollutant sources or have a cumulative impact on criteria air pollutants will be negligible. SRS could be in an area declared nonattainment for PM_{10}, $PM_{2.5}$, and ozone at some future date. When an area is designated nonattainment for any of the criteria pollutants, the affected State must draft a plan known as a State Implementation Plan (SIP) to improve air quality and outline the control measures the State will take in order to meet National Air Quality Standards (NAAQS). These air pollution control measures include a process called Nonattainment New Source Review (NA NSR) permitting. NA NSR applies to new major sources or major modifications at existing sources for pollutants where the source location is not in attainment with NAAQS. All NA NSR permits require that the proposed air pollution source install the Lowest Achievable Emission Rate (LAER), pollution controls, emission offsets, and an opportunity for public involvement. LAER is the most stringent emission limitation derived from either of the following: the most stringent emission limitation contained in the SIP for a similar source, or the most stringent emission limitation achieved in practice by a similar source. Also, sources must obtain emissions reductions from existing sources located in the vicinity of the source NA NSR source. The emission reductions, generally called "offsets" must offset the emissions increase from the new source or major source modification to ensure reasonable progress toward meeting the NAAQS. The emission reductions must also provide a net air quality benefit. DOE expects that there will be a decrease of approximately 100,000 tons a year of carbon dioxide emissions by switching from coal combustion to biomass combustion and that the potential cumulative impacts of the actions evaluated in the EA on the human environment will be minimal.

Floodplain Statement of Findings: This is a Floodplain Statement of Findings prepared in accordance with Title 10 Code of Federal Regulations Part 1022. A floodplain and wetlands assessment was incorporated in the EA. With the implementation of all best management practices, to both minimize runoff from the construction site and minimize direct encroachment on the wetlands and their associated floodplains, DOE expects the overall impacts to wetlands and floodplains of UTR from the proposed project will be minimal and short term. No long-term impacts are foreseen. DOE will allow 15 days of public review after publication of this statement of findings before implementing construction of the proposed biomass cogeneration facility and two new biomass heating plants at K and L-Areas.

Determination: Based upon the information and analyses in the EA (DOE/EA-1605), DOE has determined that the proposed construction and operation of the new biomass cogeneration facilities and heating plants at SRS do 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 FONSI.

Signed in Aiken, South Carolina, this 6th day of August 2008.

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