

Finding of No Significant Impact

Westinghouse Electric Corporation -- High-Temperature
Solid Oxide Fuel Cell Generator Development Project

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

ACTION: Finding of No Significant Impact (FONSI)

SUMMARY: The DOE has prepared an Environmental Assessment (DOE/EA-0510) that analyzes the potential impacts for conducting research, development, and testing of high-temperature solid oxide fuel cells/generators. Westinghouse would conduct the project at two existing facilities located in Churchill and Monroeville, Pennsylvania. Based on the analysis 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 is not required and the Department is issuing this FONSI.

COPIES OF THE EA ARE AVAILABLE FROM:

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BACKGROUND: The Department of Energy (DOE) proposes to enter into a 5-year cooperative agreement with the Westinghouse Electric Corporation for the development of high-temperature solid oxide fuel cell (SOFC) generators. The objective of the project is to advance the SOFC technology to the point of acceptable risk for private sector commercialization. The project would continue research and development (R&D) work conducted under a previous DOE contract. The proposed agreement would continue and broaden the scope of that effort by allowing for further technology R&D and testing activities.

The DOE has prepared this FONSI and the Environmental Assessment (EA) upon which the FONSI is based in compliance with the National Environmental Policy Act of 1969 (NEPA), the President's Council on Environmental Quality (CEQ) regulations, and the DOE Guidelines implementing NEPA.

DESCRIPTION OF THE PROPOSED ACTION: The proposed project involves the use of solid oxide fuel cells as electrochemical devices to convert the chemical energy of a reaction directly into electrical energy. Gaseous fuels (usually hydrogen and/or various hydrocarbons) are fed continuously to the anode (negative electrode) and an oxidant (usually oxygen from air) is fed continuously to the cathode (positive electrode). Electrochemical reactions occur at the electrodes that result in the combination of oxygen and hydrogen (and/or carbon monoxide) to form water (and/or carbon dioxide). This reaction involves

the transfer of electrons from the anode to the cathode through an external circuit that results in the production of electric power. The cells would be stacked in series or parallel configurations to build voltage and power, as appropriate, for various sizes of generators.

Under the proposed project, Westinghouse would conduct market and system analysis activities to identify user requirements and define technology development criteria. This information would guide the cell technology R&D activities, which include cost, performance, and scale-up improvements. Process development activities would also be conducted to support future commercial manufacturing requirements beyond this effort.

Generators of increasing size ranging from 25-kWe to 100-kWe (500-1,000 cells per unit) are planned for testing to demonstrate progression of the technology and establish commercial readiness. The overall project goal would be to improve cell performance, scale-up the technology, reduce cell fabrication costs, and aid in the testing of the technology leading to demonstration capability.

All of the research, development, fabrication, and some test activities would be conducted at two currently permitted Westinghouse facilities located in the suburbs of Churchill and Monroeville, 12 and 17 miles respectively, east of downtown Pittsburgh, Pennsylvania. The majority of the R&D activities would be conducted at the Westinghouse Science & Technology Center (STC) in Churchill, PA. This facility is a multi-purpose

R&D laboratory built on a 150-acre site and currently has over 1,200 employees. The remainder of the R&D and cell fabrication activities would be conducted at the SOFC Pre-Pilot Plant Manufacturing Facility (PPMF) located in Monroeville, PA. This 28,000 square foot manufacturing facility houses all the necessary equipment for the fabrication, assembly, and testing of solid oxide fuel cells/generators. The facility is capable of producing up to 10,000 cells per year.

ENVIRONMENTAL IMPACTS: Potential environmental impacts of the proposed action were analyzed for the two existing sites to be used. The project would not require any new construction, but it would involve minor modifications to equipment within the existing laboratory/manufacturing facilities. Analysis of air emissions, water effluent, and solid waste discharges for each site was conducted.

STC: The STC laboratory is a currently permitted R&D facility. The R&D work to be conducted at this facility would not generate any new air emissions and would be within the existing permit limits for the facility. An estimated 100,000 gallons of water would be required for material and process R&D activities. A small amount of solid waste could be produced from the proposed bench-scale R&D; subsequent testing of the fuel cell would not produce solid waste. Water needed for the R&D activities is within the capacity readily available to the laboratory facility. The project would not present new solid or

liquid effluent contaminants in quantities above the capacity readily handled by the existing, routine laboratory operating procedures.

PPMF: Work conducted at the PPMF facility would involve the use of electrochemical vapor deposition (EVD) process. In EVD, metal chlorides react in a humidified environment (reactor vessel) to form metal oxide coatings. The project associated gaseous emissions for the facility are nitrogen, oxygen, carbon dioxide, chlorine, and hydrochloric acid. The largest volume of emissions are attributed to elemental nitrogen (6,940,000 lbs/year) and oxygen (1,400,000 lbs/year). Water is also a chemical byproduct of the reaction. The Allegheny County Bureau of Air Pollution Control determined that, based on the calculated emissions, no air pollution control permits would be necessary for the operation of the PPMF.

A limited amount of wastewater, the main contaminant constituents of which are nickel and chromium, would be produced during the fabrication of the fuel cells. Quantities generated on a monthly average have been 0.19 mg/l of nickel and 0.005 mg/l of chromium, which are far below the federal categorical limits of 3.98 mg/l and 2.77 mg/l respectively. According to current practice, liquid waste streams are treated to remove regulated contaminants and the resultant supernatant liquor is released to the sewer. The small quantity of wastewater treatment sludge (nickel and chromium) and contaminated pump oil from the EVD (hazardous wastes) would be collected and temporarily stored in

separate drums. These would be shipped off site by a certified disposal service organization to a licensed disposal facility in accordance with Resource and Conservation Recovery Act (RCRA) regulations for a small quantity generator.

The environmental effects associated with the High-Temperature Tubular Solid Oxide Fuel Cell Generator Development Project with Westinghouse Electric Corporation have been reviewed. This project is expected to have no impact on noise levels, floodplains, wetlands, ecological resources, historic areas, or socioeconomic resources. Impacts on air quality, water quality, and solid waste management are expected to be minimal.

ALTERNATIVES CONSIDERED: Alternatives to the proposed action were considered in the EA. A "No Action Alternative" would result in continued operation of less efficient, higher environmentally impacting systems. There are no alternative sites that are adequate to conduct the proposed project. Westinghouse is the sole developer of tubular SOFCs in the world, thus, selection of an alternate site would involve duplicating the existing facilities at great expense and severely impact technology development progress. Potential alternate utility or industrial power generation technologies such as fossil-based molten carbonate fuel cells (MCFC) or gas turbine engine systems are at a similar stage of development as the SOFC. Selection of alternative technologies would delay or prevent availability of

the SOFC technology to provide clean and efficient electric power generation.

PUBLIC AVAILABILITY: Copies of the EA and the FONSI will be distributed to all persons and agencies known to be interested in or affected by the proposed action or alternatives including appropriate agencies within the State of Pennsylvania.

Additional copies of the EA and FONSI are available on request from the DOE directly and from the Morgantown Energy Technology Center at the address given above.

DETERMINATION: The proposed action, the Westinghouse Tubular SOFC Generator Development Project, does not constitute a major federal action normally requiring the preparation of an environmental impact statement. Based on the analysis provided in the EA, DOE determines that this action will not significantly affect the quality of the human environment within the meaning of the National Environmental Policy Act, 42 U.S.C. 4321 et seq. Therefore, an Environmental Impact Statement is not required.

ISSUED IN WASHINGTON, D.C. ON November 5, 1991.



Paul L. Ziemer, Ph.D.
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