NATIONAL ENERGY TECHNOLOGY LABORATORY
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AUG 12 2009

MEMORANDUM FOR Distribution

FROM: Carl O. Bauer Robert A Carabetta for
Director, National Energy Technology Laboratory

SUBJECT: Finding Of No Significant Impact for Design and Construction of an Early Lead Mini-Fischer-Tropsch Refinery at the University of Kentucky

The U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) has prepared an Environmental Assessment (EA), (DOE/EA-1642), for providing funding for the proposed Early Lead Mini-Fischer-Tropsch Refinery project. The project would be located at the University of Kentucky Center for Applied Energy Research, Lexington, Kentucky.

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. This Finding Of No Significant Impact (FONSI) has been prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended, and the Council on Environmental Quality regulations (40 CFR Parts 1500-1508). Accordingly, the preparation of an Environmental Impact Statement (EIS) for this proposed action is not warranted and DOE is issuing this FONSI.

A copy of the FONSI is attached. Please direct any questions regarding the EA or FONSI to John Ganz at 304-285-5443 or Roy Spears at 304-285-5460.

Attachment

FINDING OF NO SIGNIFICANT IMPACT

PROPOSED DESIGN AND CONSTRUCTION OF AN EARLY LEAD MINI-FISCHER-TROPSCH REFINERY AT THE UNIVERSITY OF KENTUCKY CENTER FOR APPLIED ENERGY RESEARCH NEAR LEXINGTON, KENTUCKY

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–1642), for providing funding to advance the design and construction of a proposed Early Lead Mini-Fischer-Tropsch Refinery to be located at and operated by the University of Kentucky Center for Applied Energy Research north of Lexington, Kentucky.

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.

BACKGROUND: The Proposed Action is consistent with the objectives of DOE and NETL to reduce the costs and improve the performance of liquid fuels derived from domestic coal available to the transportation sector. Transportation accounts for over one third of all CO_2 emissions in the United States. Further, transportation is the least energy–diverse sector in the nation's economy, with petroleum accounting for more than 95 percent of the fuel consumed.

There are two different methods for converting coal to liquid fuel: direct liquefaction and indirect liquefaction. Direct coal liquefaction converts coal to a liquid by dissolving the coal in a solvent at high temperature and pressures. Indirect coal liquefaction, which is being considered under the Proposed Action, first gasifies the coal with steam to form a mixture of hydrogen and carbon monoxide. This synthetic gas mixture, or "syngas", is then converted to liquid fuels in a second process using the Fischer-Tropsch reaction which uses catalysts, primarily iron or cobalt, to cause hydrogen to bond with oxides of carbon producing higher, predominantly straight chain hydrocarbons.

The Proposed Action directly supports the objectives of the Energy Policy Act of 2005 which authorizes the Secretary of Energy to carry out a program to evaluate the commercial and technical viability of advanced technologies for the production of Fischer-Tropsch transportation fuels and other transportation fuels from domestic coal The use of such coal to liquid (CTL) fuels could lessen the United States' dependence on imported oil and reduce CO_2 emissions from the transportation sector.

Congress also authorized DOE to enter into agreements for capital modifications and construction of new facilities at the Southern Illinois University Coal Research Center, the Energy Center at Purdue University, and the University of Kentucky (UK) Center for Applied Energy research (CAER), a 55,000 square foot research facility located on the University of Kentucky's 125-acre research park at 2540 Research Park Drive near Lexington, KY. The universities subsequently entered into a Memorandum of Understanding with each other to form the Coal Fuel Alliance (CFA) to support complementary and joint research focusing on applied and developmental needs for CTL.

During its planning, the CFA identified one early lead foundational capability that was critically needed to support the other universities; that being, the development of an early lead mini Fischer-Tropsch refinery to be constructed at UK CAER. Such a facility requires significant lead time in the range of two to three years for Front End Engineering and Design (FEED), procurement, and construction. The proposed mini Fischer-Tropsch refinery is intended to produce research quantities of Fischer-Tropsch liquids and finished fuels for subsequent testing by the other universities.

DESCRIPTION OF THE PROPOSED ACTION: The Proposed Action is for DOE to provide funding to advance the design and construction of the Early Lead Mini Fischer-Tropsch Refinery (Mini FT Refinery) to be housed in a dedicated new facility at the UK CAER north of Lexington in Fayette County, KY. The Mini FT Refinery would produce research quantities (~ 1 barrel/day) of Fisher-Tropsch liquids and finished fuels for subsequent testing at other universities. It would also provide open-access facilities and information in the public domain that would aid the wider scientific and industrial community in testing and evaluating the commercial viability of Fischer-Tropsch technology. These facilities would provide a means for independently verifying vendor claims as well as validating fuel performance and quality. A primary objective of the research conducted on fuels produced by the Mini FT Refinery would be to evaluate environmental considerations – particularly how to manage and reduce carbon dioxide emissions from CTL facilities and from the use of such fuels.

Under the Proposed Action, DOE would provide $1,370,065 in Federal funding to the CFA. The Mini FT Refinery is expected to be operational within two to three years at a total cost of approximately $12 MM. The partial funding provided under DOE's Proposed Action would allow the UK CAER under the CFA to select technologies and technology providers of process equipment to be used in the Mini FT Refinery and completing the FEED study. In addition, the incremental funding provided by DOE would allow CAER to prepare the architectural and engineering plans and specifications of the refinery building and construct the 2,700 square foot refinery building and the associated plant utilities and infrastructure.

Once operational, syngas for the Mini FT Refinery would be produced on-site by reforming approximately 10,000 standard cubic feet per day of natural gas using a skid-mounted reformer located within the new facility. Reforming natural gas would require running a natural gas line approximately 450 feet from an existing 6-inch natural gas header located on the southern edge of the property to the new facility.

Fischer-Tropsch synthesis would occur in a Slurry Bubble Column Reactor (SBCR) containing iron or cobalt catalysts. The SBCR is expected to be small measuring approximately 5 inches in diameter with a height of approximately 12½ feet. The expected yield of Fischer-Tropsch liquids is approximately 5 grams of hydrocarbon per gram of catalyst per hour. The SBCR would be designed to operate continuously producing approximately 1 barrel of hydrocarbons per day. Because of the research nature of the intended operations, UK CAER anticipates operating the SBCR about 4 times per year for a duration of about 1 month each time. UK CAER researchers anticipate that the SBCR would run continuously during the process runs for periods not expected to exceed 20 consecutive days. The remaining time during a one-month test would be used for start-up, shutdown, etc. and would include changing out the catalyst in the SBCR. Other processes would operate in a batch mode.

ENVIROMENTAL CONSEQUENCES: Environmental consequences associated with construction and operation of the facility under the Proposed Action was considered in the EA. The main issues of concern examined in the EA were related to potential impacts to groundwater resources, cultural resources, and air quality as a result of construction and continued operation of the Mini-FT Refinery. The EA also considered cumulative impacts that might reasonably occur as a result of successful research into performance of Fischer-Tropsch fuels derived from domestic coal.

The UK CAER is located in the delineated wellhead protection area (WHPA) of Royal Spring, a source of water for the Georgetown Municipal Water Service located approximately 5.5 miles to the northwest. The new 2,700 square foot facility would be constructed adjacent to the exiting UK CAER and would also be located in the WHPA for Royal Spring. The Fischer-Tropsch fuel produced at the new facility would be temporarily stored on-site at the UK CAER until it could be transported to other universities. The product would be stored in barrels on spill pallets in a dedicated and secured storage area on the UK CAER property. Prior to start of operations UK CAER would prepare a Groundwater Protection Plan to document practices designed to minimize the potential for release of fuel during storage and transport.

Kentucky's archeological resources are extensive. The UK CAER is located in the Bluegrass Management Area which has a large number of archeological sites (nearly 18% of all known sites within the state). The majority of these sites are found within the Central Bluegrass Section, which includes Fayette County. During initial consultation with the Kentucky Heritage Council – State Historic Preservation Office, DOE became aware of two known archaeological sites in proximity to the existing UK CAER facilities. DOE delineated a bounded area for the proposed new construction and provided it to the Kentucky Heritage Council for review. The State Historic Preservation Officer (SHPO)

subsequently determined that the proposed facility would not affect any site eligible for listing on the National register of Historic Places.

Fayette County is in attainment for all National Ambient Air Quality Standards. Construction of the new facility would generate particulates (localized exhaust fumes and dust); fugitive emission of dust would be controlled by best management practices, and construction vehicles hauling materials with a potential to become airborne would be covered. Operation of the Mini FT Refinery is expected to emit approximately 1,500 pounds of carbon monoxide annually in addition to some light hydrocarbons. Both the carbon monoxide and the hydrocarbons would be incinerated in a flare so that no discernible contribution to concentrations of criteria pollutants in ambient air would be expected. Potential emissions from operation of the proposed Mini FT Refinery are expected to be below Kentucky Division for Air Quality thresholds requiring permit or registration. A final determination of permit requirements would be made after completion of the engineering and design study.

A primary objective of the Proposed Action is to evaluate the commercial and technical feasibility of advanced technologies for the production of transportation fuel from domestic coal, a readily available domestic energy source. A desired outcome of the Proposed Action consistent with the DOE's mission and United States' energy policy is that some commercialization of CTL would occur. However, quantifying the extent to which widespread commercialization and early deployment of Fischer-Tropsch fuels made from domestic coal would result from the research conducted as a result of the Proposed Action would be speculative and beyond the scope of the EA.

The continued use of domestic coal as part of the energy portfolio of the United States for the foreseeable future is a national policy decision. An underlying assumption of this policy decision is that domestic coal will continue to be available as a commodity at market prices. Coal resources in the United States are dispersed with proven reserves in 26 states. Methods of extraction also vary depending on local environmental, economic, regulatory, and technical factors. In preparing the EA and this decision, DOE assumed that coal will continue to be extracted in the United States in compliance with applicable federal and state regulations. Quantifying environmental impacts associated with mining coal to supply a future commercial CTL industry would be speculative and beyond the scope of the EA.

ALTERNATIVES CONSIDERED:

Proposed Action

DOE proposes to provide $1,370,065 in Federal funding to the CFA to advance the design and construction of a dedicated Mini FT Refinery building at the UK CAER on state-owned property north of Lexington, KY. Under the Proposed Action, the CFA would be able to: evaluate and select technologies and technology providers for primary process units, complete a front end engineering and design study of process units, complete Architectural/Engineering Plans and Specifications for the refinery building,

construct the ~2,700 square foot refinery building and utility systems, and provide project management and reporting.

No Action

Under the No Action alternative, the DOE would not provide funding to advance the design and construction of the Mini FT Refinery. If DOE funding were eliminated to the UK CAER Mini FT Refinery, the possible outcomes could include the CFA securing 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 Mini FT Refinery would be cancelled. Cancellation would mean this Mini FT Refinery would not be available to advance research and development of CTL fuels for the transportation sector.

PUBLIC AVAILABILITY: DOE encourages public participation in the NEPA process. Comments were invited on this Draft EA for a period of 30 days after publication in the *Lexington Herald-Leader* of the Notice of Availability beginning May 10, 2009. Copies of the Draft EA were made available for review at the Lexington Public Library Northside Branch located at 1733 Russell Cave Road and also at the UK CAER main receptionist located at 2540 Research Park Drive. The public was encouraged to submit comments to Roy Spears at the address, phone number, or e-mail listed above by close of the comment period on June 10, 2009. No comments on the Draft EA were received from members of the public during the comment period. Agency comment letters which were received during the EA scoping and review period are summarized below.

On January 14, 2009, the United States Fish and Wildlife Service (USFWS) Kentucky ES Field Office responded to a DOE Endangered Species Act Section 7 consultation request stating that no significant adverse impacts to wetlands of federally listed endangered or threatened species are anticipated from the Proposed Action.

On March 3, 2009, the State Historic Preservation Office of the Kentucky Heritage Council responded to a DOE section 106 Historic Preservation Act consultation request finding that there is No Historic Properties Present within the proposed undertaking's area of potential impacts. However, the SHPO stated that the State Historic Preservation Office should be contacted should the project extend outside of the delineated boundaries as there are recorded archeological sites very close to the project area.

On June 15, 2009 the Environment and Energy Council (EEC) of the Kentucky Department of Environmental Protection responded to DOE with comments of the draft EA. The EEC coordinates environmental reviews for the Division of Water, Division of Waste Management, Division for Air Quality, Kentucky Heritage Council, Division of Conservation, Department of Natural Resources, Division of Energy Development and Independence, and the Kentucky State Nature Preserves Commission.

The Division for Air Quality noted applicable Air Quality permitting requirements under Title 401 of the Kentucky Administrative Rules and suggested controls for fugitive

emissions during construction. The Division also suggested that local government regulations be reviewed to ensure compliance. The Division of Water advised that a stream construction permit would be needed if the Proposed Action included construction within a stream or its 100-yr floodplain. The Division further noted that the existing facility is located within a Zone 1 Wellhead Protection Area for Royal Spring, a source of drinking water for the Georgetown Municipal Water Service in nearby Scott County. The Division advised that a Groundwater Protection Plan may be needed for both construction and operation of the proposed facility. The Division of Energy Development and Independence noted the Division of Water's 2008 Report to Congress on Water Quality in which it is reported that 38% of all surface waters assessed are impaired because of mining and raised concern over cumulative impacts on wildlife, habitat, or water resources because of increased demand for coal. The final EA was revised to address these comments to the extent practicable.

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, for DOE to provide $1,370,065 in federal funding to advance the design and construction of an Early Lead Mini Fischer-Tropsch Refinery at the UK CAER north of Lexington in Fayette County, KY 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 12th DAY OF AUGUST 2009

Carl O. Bauer
Director
National Energy Technology Laboratory