PMC-ND
(1.08.09.13)

U.S. DEPARTMENT OF ENERGY
OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY
NEPA DETERMINATION

RECIPIENT: Washington State University **STATE:** WA

PROJECT TITLE Optimizing the Heisenberg Vortex Tube for Hydrogen Cooling

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0001874	DE-EE0008429	GFO-0008429-001	GO8429

Based on my review of the information concerning the proposed action, as NEPA Compliance Officer (authorized under DOE Policy 451.1), I have made the following determination:

CX, EA, EIS APPENDIX AND NUMBER:
Description:

A9 Information gathering, analysis, and dissemination	Information gathering (including, but not limited to, literature surveys, inventories, site visits, and audits), data analysis (including, but not limited to, computer modeling), document preparation (including, but not limited to, conceptual design, feasibility studies, and analytical energy supply and demand studies), and information dissemination (including, but not limited to, document publication and distribution, and classroom training and informational programs), but not including site characterization or environmental monitoring. (See also B3.1 of appendix B to this subpart.)
B3.6 Small-scale research and development, laboratory operations, and pilot projects	Siting, construction, modification, operation, and decommissioning of facilities for smallscale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment.

Rationale for determination:

The U.S. Department of Energy (DOE) is proposing to provide funding to Washington State University (WSU) to design, develop, fabricate, and test a Heisenberg Vortex Tube (HVT); a hydrogen delivery device intended to increase hydrogen liquefaction cycle efficiency and lower the cost of liquid hydrogen delivery. Experiments would be conducted alongside development of the HVT, to further research on vortex tube operation and development. The project would be completed over three Budget Periods (BPs), with a Go/No-Go Decision Point in between each BP.

Proposed project activities for BP1 would include refurbishing WSU's Cryocatalysis Hydrogen Experiment Facility (CHEF) to enable operations at increased pressures (e.g. up to 70 bar), computer modeling of HVT designs, development of an HVT design specifications document, HVT performance modeling, and selection of field test locations for HVT testing. BP2 activities would include HVT operational testing in the CHEF, HVT optimization (e.g. optimization of catalyst surface coating and application to HVT), and fabrication/assembly of HVT field test articles. BP3 activities would consist of continued operational testing and analysis of the HVT in the CHEF and implementation of HVT field trials at one of sub-recipient Plug Power's customer distribution center.

All laboratory activities would be performed by WSU and Plug Power at existing, purpose built facilities at WSU's main campus in Pullman, WA and at Plug Power's manufacturing facility in Latham, NY. Both facilities regularly conduct work similar in nature to that proposed as part of this project. WSU's CHEF is an existing cryogenic system used for orthohydrogen-parahydrogen conversion testing, housed within WSU's Hydrogen Properties for Energy Research (HYPER) Laboratory. The refurbishments to CHEF mentioned in the paragraph above would consist of replacing mechanical fittings and joints in the condenser tank with welded parts to minimize leaks and increase pressure capacity. No change in the use, mission or operation of existing WSU or Plug Power facilities would be required. Likewise, no new permits, licenses, or authorizations would be required to perform project activities.

Field testing would be conducted at one of Plug Power's customer distribution centers that would be selected after the project is initiated. With the exception of the HVT equipment to be tested, the selected site would already have

the necessary equipment installed, including bulk liquid hydrogen storage, hydrogen pumping and compression, high pressure hydrogen gas storage, hydrogen dispensing and hydrogen fuel cells already in operation. The selected site would have experience operating hydrogen storage and fueling equipment and have been trained in the operation of this equipment. Plug Power and WSU would perform equipment installations and testing. Authorization to install the HVT equipment would be obtained from the customer prior to initiating field testing. Additionally, an installation work plan and testing plan would be developed to minimize impacts to customer operations. No other changes in the use, mission or operation of this facility would be required.

Project work would include the use and handling of gases (e.g. hydrogen) and platinum group metals (e.g. ruthenium). Experimental hydrogen studies have inherent hazards related to the flammability and cryogenic nature of the fuel. A Safety Plan has been submitted to the DOE and reviewed by the Hydrogen Safety Panel. Additionally, risks would be mitigated through adherence to existing health and safety policies and procedures. Protocols would include personnel training and the use of proper ventilation equipment (e.g. hydrogen vent line and fume hoods), a high-vacuum chamber for testing within the CHEF, a dedicated battery backup system to ensure safety in the event of a power outage, an external flammable gas storage close, and personal protective equipment. All work activities would comply with relevant Federal, state, and local health, safety and environmental regulations.

NEPA PROVISION

DOE has made a final NEPA determination.

Notes:

Fuel Cell Technologies Office
This NEPA determination does not require a tailored NEPA Provision.
NEPA review completed by Jonathan Hartman, 11/21/2018

FOR CATEGORICAL EXCLUSION DETERMINATIONS

The proposed action (or the part of the proposal defined in the Rationale above) fits within a class of actions that is listed in Appendix A or B to 10 CFR Part 1021, Subpart D. To fit within the classes of actions listed in 10 CFR Part 1021, Subpart D, Appendix B, a proposal must be one that would not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, or similar requirements of DOE or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities (including incinerators), but the proposal may include categorically excluded waste storage, disposal, recovery, or treatment actions or facilities; (3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that preexist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources, including, but not limited to, those listed in paragraph B(4) of 10 CFR Part 1021, Subpart D, Appendix B; (5) involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species, unless the proposed activity would be contained or confined in a manner designed and operated to prevent unauthorized release into the environment and conducted in accordance with applicable requirements, such as those listed in paragraph B(5) of 10 CFR Part 1021, Subpart D, Appendix B.
There are no extraordinary circumstances related to the proposed action that may affect the significance of the environmental effects of the proposal.
The proposed action has not been segmented to meet the definition of a categorical exclusion. This proposal is not connected to other actions with potentially significant impacts (40 CFR 1508.25(a)(1)), is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1508.27(b)(7)), and is not precluded by 40 CFR 1506.1 or 10 CFR 1021.211 concerning limitations on actions during preparation of an environmental impact statement.
The proposed action is categorically excluded from further NEPA review.

SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature: Electronically Signed By: Casey Strickland Date: 11/21/2018

NEPA Compliance Officer

FIELD OFFICE MANAGER DETERMINATION

- [x] Field Office Manager review not required
- [ ] Field Office Manager review required

BASED ON MY REVIEW I CONCUR WITH THE DETERMINATION OF THE NCO :

Field Office Manager's Signature: _____ Date: _____

Field Office Manager