PMC-ND

(1.08.09.13)

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

RECIPIENT: Southwest Research Institute **STATE:** TX

PROJECT TITLE : High-Temperature Permanent Magnet-Biased Active Magnetic Bearing Development for Supercritical CO2 Machinery Applications

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0002378	DE-EE0009823	GFO-0009823-001	

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 the Southwest Research Institute (SwRI) for the conceptual design of high-temperature permanent magnet biased active magnetic bearings (PM-AMBs) (permanent magnets used for bearings to significantly reduce their resistance; often used in magnetic levitation) conceptual design modifications to an existing machine train to utilize PM-AMBs, and testing key materials for PM-AMB construction and operation. Testing would include the exposure of certain materials to different pressures, temperatures, and industrial grade CO2, as well as post-exposure testing. The project would take place over one budget period.

The conceptual design for machinery and exposure testing of selected PM-AMB materials in CO2 would occur at SwRI in San Antonio, TX with assistance from Calnetix in Cerritos, CA. GE in Niskayuna, NY would perform the post-test evaluation of magnetic material properties, as well as the testing and comparison of properties when exposed to different temperatures and exposed to CO2 at SwRI. GE would also contribute to the technoeconomic analysis that would be completed at the end of the project, in conjunction with Heliogen in Pasadena, CA.

Proposed project activities would include a preliminary and a final stage. The preliminary stage would comprise the design of the rotor-bearings system and the definition of the load requirements and design targets for PM-AMBs. Preliminary bearing sizes would be used to create predictions to define new bearing performance targets. Radial and axial PM-AMB size and performance for each bearing in the two trains would be estimated and reviewed in order to select one of each for the final conceptual design. Material testing and evaluation of key materials would take place to assess candidate materials and coatings. Both bare and coated materials would be exposed to high temperature COs at ambient and high pressure. Pressurized exposure would occur in an autoclave, and the rest would occur in a furnace. Compromised materials would be ruled out and the efficacy of materials would be assessed. For the final stage, a final conceptual design of the bearings and turbomachinery would be created. Technoeconomic analysis would be carried out to compare performance and costs of hermetic machinery and PM-AMBs with conventional non-hermetic and oil-lubricated bearings. A technological maturation plan would be

developed, and a final review of the conceptual designs and material tests would transpire.

Testing would involve high temperatures and 109kg of high pressure industrial grade CO2 at SwRI and GE, which would be released into the atmosphere. Operations at GE would also include 10 bottles of Argon gas. These test facilities have been designed to accepted standards and safe operating procedures have been successfully demonstrated in previous project use. The activities pose no risk to the public. Existing corporate health and safety policies and procedures would be followed, including employee training, personal protective equipment, engineering controls, and internal assessments. Both organizations would follow all OSHA safety practices, managed in accordance with Federal, state, and local guidelines.

No facility modifications, ground disturbing activities, changes to operation of existing facilities, or installation of outdoor equipment is planned. There are no required changes to permits, licenses, or authorizations.

NEPA PROVISION

DOE has made a final NEPA determination.

Notes:

Solar Energy Technologies Office (SETO)
This NEPA determination does not require a tailored NEPA provision.
Review completed by Alex Colling on 01/17/21.

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: Kristin Kerwin Date: 2/1/2022

NEPA Compliance Officer

FIELD OFFICE MANAGER DETERMINATION

☑ 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