PMC-ND
(1.08.09.13)

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

RECIPIENT: Pennsylvania State Univ   **STATE:** PA

PROJECT TITLE: Machine Learning Approaches to Predicting Induced Seismicity and Imaging Geothermal Reservoir Properties

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0001956	DE-EE0008763	GFO-0008763-002	

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 federal funding to the Pennsylvania State University (PSU) to apply machine learning (ML) methods to Microearthquake (MEQ) data for imaging geothermal reservoir properties and forecasting seismic events, in order to advance geothermal exploration and safe geothermal energy production. ML approaches would be developed and tested using large datasets of induced seismicity associated with geothermal field sites in addition to data collected from in-lab experiments.

The proposed project consists of two Phases. A previous NEPA determination for this award reviewed Phase I activities (GFO-0008763-001; CX A9, B3.6; 7/10/2019) but restricted Phase II pending a competitive down select. This final NEPA determination is for Phase II of the proposed project.

The scope of Phase II would be comprised of data analysis, computer modeling, and laboratory research. The project would use data from existing Enhanced Geothermal Systems (EGS) sites to develop and test ML methods to locate induced seismicity, image geothermal reservoir properties, predict lab earthquakes, and predict fluid injection characteristics of wells as a proxy for EGS performance. No fieldwork would be required to collect or process data.

Experiments to measure rock properties and characteristics of simulated earthquakes would be conducted in a purpose-built rock mechanics laboratory at Penn State (State College, PA). No new equipment or facility modifications would be necessary. The project would use approximately 10 to 20 kg of rock samples along with minor amounts of metals, plastics, and paper. All such materials would be reused or recycled according to established policies and procedures at Penn State. The project would not involve the use or handling of hazardous materials.

NEPA PROVISION

DOE has made a final NEPA determination.

Notes:

Geothermal Technologies Office
This NEPA determination does not require a tailored NEPA Provision.
NEPA review completed by Whitney Doss Donoghue, 7/26/2021

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: 7/27/2021
<div style="text-align:center">NEPA Compliance Officer</div>

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: _____
<div style="text-align:center">Field Office Manager</div>