PMC-ND
(1.08.09.13)

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

RECIPIENT: Texas A&M University **STATE:** TX

PROJECT TITLE: Targeted energy focusing to induce micro-cracking for reduced cutting energy and increased rate of penetration

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0001880	DE-EE0008605	GFO-0008605-001	

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.
B3.11 Outdoor tests and experiments on materials and equipment components	Outdoor tests and experiments for the development, quality assurance, or reliability of materials and equipment (including, but not limited to, weapon system components) under controlled conditions. Covered actions include, but are not limited to, burn tests (such as tests of electric cable fire resistance or the combustion characteristics of fuels), impact tests (such as pneumatic ejector tests using earthen embankments or concrete slabs designated and routinely used for that purpose), or drop, puncture, water-immersion, or thermal tests. Covered actions would not involve source, special nuclear, or byproduct materials, except encapsulated sources manufactured to applicable standards that contain source, special nuclear, or byproduct materials may be used for nondestructive actions such as detector/sensor development and testing and first responder field training.

Rationale for determination:

The U.S. Department of Energy (DOE) is proposing to provide federal funding to Texas A&M University (Texas A&M) to design, develop, fabricate and test an advanced drilling technology. Specifically, Texas A&M would develop drilling technology integrating microplasma discharges to “pre-fracture” rock prior to drilling. This would increase the rate of penetration and enhance rock reduction in drilling operations. The project would be completed over two Budget Periods (BPs), with a Go/No-Go Decision Point in between each BP.

Proposed project activities for BP1 would include demonstration/characterization of plasma-induced rock fracturing, orthogonal cutting tests at atmospheric pressure, computer modeling and simulation, and assembly of a hydraulic-to-plasma energy conversion setup for in-situ plasma generation. The rock fracturing demonstration would include assembly of a dedicated nanosecond plasma generating system and a fluid tank with optical access, as well as a small (~100 mL) high pressure (5000 psi) test cell to demonstrate the feasibility of plasma generation in liquids at extreme pressure. Orthogonal cutting tests would be performed on a computer numerical control (CNC) mill. A commercially available hydro turbine would be used for the hydraulic-to-plasma energy conversion test setup. The test setup would consist of a supply pump, the purchased hydro turbine, a custom built electrical circuit for step-up ac-to-dc electrical conversion, and a spark gap setup to produce the microplasma discharge high voltage (kV range).

Proposed project activities for BP2 would include plasma testing in simulated drilling environments, orthogonal cutting tests at extreme pressure, computer modeling, retrofit of an energy conversion unit for operation with drilling fluids, integration of microplasma technology into the test rig’s drill head, and drilling tests to characterize/verify the technologies developed. Drilling tests would be performed on an existing skid-mounted rig, approximately 30 ft. in length. The rig currently consists of a variable speed electric motor, speed reducing gearbox, swivel for drilling mud transfer to the rotating shaft, shaft support bearings, drill bit, sealing system, carriage mounted formation sample with

hydraulic cylinder actuator, force and motion measurement system, and a drilling mud collection system. Retrofits would be limited to integrating the pre-drill rock fracturing device and auxiliary equipment.

All project activities would be completed at Texas A&M's campus at College Station, TX. Laboratory work would be completed in existing, purpose-built laboratory facilities at Texas A&M's University Services Building (USB). All drilling activities would be performed using the modified test rig described above, in an existing testing area located directly outside of the USB. The testing rig is already installed in the testing area and has been actively used prior to this project. No changes in the use, mission, or operation of existing facilities would be required. Texas A&M would not need to obtain any additional permits in order to realize the work activities proposed as part of this award.

The U.S. Fish and Wildlife Service's (USFWS) Information for Planning and Consultation (IPaC) database indicates that 7 endangered species, including 4 bird species, 2 species of clam, and a flowering plant species have the potential to be in the area of the project. Additionally, 7 migratory bird species are also listed. However, because the drilling activities would take place exclusively on land currently used for human activities, on an unpaved dirt lot with no plant life, it is highly unlikely that any of the listed species would be present in the area, or have the potential to be affected by the project. Accordingly, DOE has determined there would be no effect on ESA-listed species as a result of this project.

The project would involve the use of rotating machinery, pressure vessels, and high voltages. All laboratory activities would be completed indoors, in supervised settings. Drilling activities would be completed outdoors at restricted entry testing facilities. In order to mitigate against potential health and safety risks associated with the completion of project activities, a project safety assessment (PSA) would be completed in coordination with Texas A&M's Environmental Health and Safety Office prior to initiating work activities. The PSA would outline training requirements, equipment hazards, and emergency procedures, among other topics. Project personnel would comply with all established health and safety protocols. Texas A&M would adhere to all local, state, and Federal health, safety and environmental regulations.

NEPA PROVISION

DOE has made a final NEPA determination.

Notes:

Geothermal Technologies Office
This NEPA determination does not require a tailored NEPA provision.
Review completed by Jonathan Hartman, 12/24/2018

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: 12/31/2018

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