PMC-EF2a

(2.04.02)

U.S. DEPARTMENT OF ENERGY
EERE PROJECT MANAGEMENT CENTER
NEPA DETERMINATION

RECIPIENT: GE Global research **STATE:** NY

PROJECT TITLE : High-potential Working Fluids for Next Generation Binary Cycle Geothermal Power Plants

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-PS36-09GO99018	DE-EE0002769	GFO-10-227	0

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

CX, EA, EIS APPENDIX AND NUMBER:

Description:

A9 Information gathering (including, but not limited to, literature surveys, inventories, audits), data analysis (including computer modeling), document preparation (such as conceptual design or feasibility studies, analytical energy supply and demand studies), and dissemination (including, but not limited to, document mailings, publication, and distribution; and classroom training and informational programs), but not including site characterization or environmental monitoring.

B3.6 Siting, construction (or modification), operation, and decommissioning of facilities for indoor bench-scale research projects and conventional laboratory operations (for example, preparation of chemical standards and sample analysis); small-scale research and development projects; and small-scale pilot projects (generally less than two years) conducted to verify a concept before demonstration actions. Construction (or modification) will be within or contiguous to an already developed area (where active utilities and currently used roads are readily accessible).

Rational for determination:

GE Global Research (GE) would evaluate novel working fluids and advanced cycle combinations for use in Organic Rankine Cycles (ORC) for Enhanced Geothermal Systems (EGS) and would optimize the overall economics for an EGS plant including power plant and drilling costs. A pilot scale test setup would be used to experimentally validate the performance predictions. All work would take place at the GE Global Research Center campus, an OSHA VPP Star facility, at 1 Research Circle, Niskayuna, NY 12309.

The project is divided into three phases with multiple tasks:

PHASE 1 – SCREEN FOR HIGH POTENTIAL WORKING FLUIDS AND DEVELOP PERFORMANCE MODEL

1. Identify high-potential working fluids for advanced cycles – Develop a pre-selection process to identify fluids whose characteristics are promising to increase power generation efficiency relative to currently utilized ORC's.
2. Evaluate cycle performance for high-potential working fluids – Utilize a performance model to predict net output power per promising working fluid and advanced cycle combination as a function of ambient and geothermal resource temperatures.
3. Identify key fluid parameters that impact cycle performance – Sensitivity analysis aimed at identifying and articulating the fluid characteristics that are most desirable for an increase in power conversion efficiency using advanced cycles.
4. Project Management and Reporting

PHASE 2 – DETERMINE REQUIRED ACCURACY OF FLUID PROPERTY DATA AND BUILD PLANT ECONOMIC MODEL

1. Identify impact of uncertainty in fluid property data on design of components – Determine level of accuracy (data from Phase 1/Task 3) required to produce robust hardware and reliable component designs.
2. Develop economic model for next generation geothermal plants – This model quantifies the impact of choice of working fluid and associated power block components, drilling, fracturing, other reservoir engineering, reservoir management, and plant layout on the overall cost of a next generation geothermal plant.
3. Project Management and Reporting

PHASE 3 – DOWNSELECT HIGH-POTENTIAL WORKING FLUID, DETERMINE FLUID PROPERTIES, AND BUILD PILOT RIG

1. Downselect high-potential working fluid/advanced cycle combination for performance evaluation
2. Determine fluid properties – Measure thermophysical and thermodynamic property data for the chosen high-potential working fluid with the required accuracy for the overall design.
3. Build pilot rig to validate performance predictions of chosen working fluid and advanced cycle design – Using data from Phase 3/Task 2, hardware components would be designed and manufactured for the advanced cycle. A pilot-scale rig would be built for validation of working fluid performance.
4. Project Management and Reporting

Reports and other deliverables would be provided in accordance with the Federal Assistance Reporting Checklist

following the instructions included therein.
According to the GE laboratory questionnaire, no additional permits are needed. Cooling water used in the closed loop system is recycled and there is no discharge. Health and safety professionals would be on staff to assist with compliance to safety regulations. The closed flow loop would be installed in a test container which is a remotely monitored, closed area. All test equipment would undergo a safety review prior to use and emergency stop provisions would automatically shut down the test equipment in the event that test conditions approach design limits. The test area has a secondary containment in case of a leak, LEL detectors to trigger the ventilation system and depending on the fluid used a fire suppression system could be employed. Small amounts of working fluid could be released with the nitrogen cover gas used to control the system pressure. This off-gas would be routed through a carbon filter (absorbing the working fluid) and the filter vendor would take back the filter for proper disposal.
This project is comprised of information gathering, data analysis, document preparation, conventional laboratory operations, and a small-scale pilot project; therefore the DOE has categorized this proposal into Categorical Exclusions A9 and B3.6.

NEPA PROVISION

DOE has made a final NEPA determination for this award

Insert the following language in the award:

Note to Specialist :

None Given.

SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature: _____ Date: 3/21/10

NEPA Compliance Officer

FIELD OFFICE MANAGER DETERMINATION

☐ Field Office Manager review required

NCO REQUESTS THE FIELD OFFICE MANAGER REVIEW FOR THE FOLLOWING REASON:

☐ Proposed action fits within a categorical exclusion but involves a high profile or controversial issue that warrants Field Office Manager's attention.
☐ Proposed action falls within an EA or EIS category and therefore requires Field Office Manager's review and determination.

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

Field Office Manager's Signature: _____ Date: _____

Field Office Manager