

PMC-EF2a

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



RECIPIENT: University of Utah

STATE: UT

PROJECT TITLE : Development of Chemical Model to Predict the Interactions between Supercritical Carbon Dioxide and Reservoir Rock in EGS Reservoirs

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
DE-FOA-0000075	DE-EE0002766	GFO-10-083	GO2766

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:

The University of Utah would develop a chemical model, based on existing models and databases, that would be capable of simulating chemical reactions between supercritical (SC) CO₂ and Enhanced Geothermal System (EGS) reservoir rocks of various compositions in aqueous, non-aqueous and 2-phase environments. All project work would be performed in the Earth Sciences Building at the University of Wyoming (UW) in Laramie, Wyoming.

The project is divided into three phases with multiple tasks:

Phase 1

1. Improve high temperature-pressure thermodynamic database
 - 1.1. Update formulas for mutual solubility and fluid properties
 - 1.2. Extend current databases of chemical equilibrium constants to a wider temperature and pressure range
2. Determine applicable chemical reactions
 - 2.1. Conduct thermodynamic analyses based on the database created in Task 1
 - 2.2. Literature reviews would be conducted and experiments for verification of the thermodynamic analyses (Task 2.1) would be performed using four key vein minerals in EGS reservoirs.

Phase 2

3. Evaluate the reactivity of minerals in aqueous and CO₂-rich fluids
 - 3.1. Conduct literature survey and numerical simulations to determine kinetic rates
 - 3.2. Conduct laboratory experiments using a few key minerals that would be selected as determined by the thermodynamic and kinetic analyses.
4. Modify existing simulators and conduct numerical simulations
 - 4.1. Modify existing simulators
 - 4.2. Conduct laboratory-scale simulations on defined experimental systems, calibrate and evaluate kinetic rates
 - 4.3. Conduct simulations to explore the possible effects of SC CO₂ interactions with EGS reservoir rock

Phase 3

5. Conduct field-scale numerical simulations
 - 5.1. Conduct simulations to identify suitable conditions for using CO₂ as a working fluid for geothermal energy extraction
 - 5.2. Conduct simulations to identify suitable conditions for using CO₂ as an acidization agent for reservoir stimulation
 - 5.3. Conduct simulations to assess the possibility of concurrent carbon sequestration
6. Investigate mineral precipitation in EGS surface facilities by 1-dimensional simulations on production wells and heat exchangers

According to the R&D Laboratory Questionnaire, no permits would be needed for the project. Liquid effluent would be 90% DI water and 10% residue from brine analysis. DI water would be treated at the local treatment facility and the residue from brine analysis would be acid neutralized before disposal. Process chemicals would be disposed of per UW hazardous waste policy. No air pollutants would be created. UW maintains a safety program and the Department

of Geology and Geophysics has an appointed a Safety Coordinator. Safety glasses, gloves, and lab coats would be used when handling chemicals.

This project is comprised of information gathering, data analysis, document preparation, and conventional laboratory operations; 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:


NEPA Compliance Officer

Date:

3/29/10

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:

Field Office Manager

Date:
