

PMC-EF2a

(20+02)

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



RECIPIENT: NREL

STATE: CO

PROJECT TITLE : 10-MW Supercritical CO2 Turbine Test; NREL Tracking No. 12-021

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
	DE-AC36-08GO28308	NREL-12-021	GO28308

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, 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.)
B5.15 Small-scale renewable energy research and development and pilot projects	Small-scale renewable energy research and development projects and small-scale pilot projects, provided that the projects are located within a previously disturbed or developed area. Covered actions would be in accordance with applicable requirements (such as local land use and zoning requirements) in the proposed project area and would incorporate appropriate control technologies and best management practices.

Rational for determination:

The U.S. Department of Energy's (DOE) National Renewable Energy Laboratory (NREL) proposes a project entitled 10-MW Supercritical CO2 Turbine Test to research technologies that have the potential to dramatically increase efficiency, lower costs, and deliver more reliable performance than existing commercial and near-commercial concentrating solar power (CSP) systems. NREL is the prime awardee of funding through a Financial Assistance Funding Opportunity Announcement (FOA) from DOE's Solar Energy Technologies Program. This proposed project would research the feasibility of Brayton power cycles utilizing supercritical carbon dioxide (CO2) as the working fluid for power generation at CSP plants. These cycles offer the potential of greater efficiency than is possible with current steam Rankine cycles used at CSP plants. This project would design and build the largest-to-date supercritical CO2 power turbine and test its performance under conditions relevant to CSP.

NREL teaming partners for this proposed project would include Abengoa Solar (Lakewood, CO) partnered with Abener Engineering (Chesterfield, MO); Echogen Power Systems (Akron, OH) partnered with Dresser-Rand (Olean and Wellsville, NY); University of Wisconsin at Madison; Barber-Nichols, Inc. (Arvada, CO); the Electric Power Research Institute (EPRI – Palo Alto, CA); and Sandia National Laboratories (Albuquerque, NM). NREL would provide funding to all partners, other than Sandia and funding for Sandia activities would come directly from DOE.

The design and fabrication of the equipment would be undertaken by the above-referenced subcontractors that have established credentials in turbomachinery and heat exchanger design, manufacturing, and sales. The unit would be skid-mounted and placed at Sandia National Laboratories for testing involving heating the system to 550C or greater with natural gas and measuring the pressure, temperature, and CO2 flow rate within the test loop as well as the rotational speed and other operational parameters of the turbomachinery. Mass and energy balances would indicate the power and efficiency of the turbine.

The proposed project work would be completed using industry standard methods and protocols, and in accordance with all federal, state, and local regulations. Work is expected to start late 2012, and run for a three and a half year period. Project work that would be performed by each partner is summarized below:

NREL project activities would be conducted in existing facilities, would be the same as work currently conducted at NREL, and would include the following:

- Performance and system modeling
- Technical assistance
- Funding and project monitoring

Abengoa Solar would conduct the following:

- Abengoa Solar's subcontractor, Abener Engineering, a division of Abeinsa, a member company of the Abengoa Group, would design the heating and cooling systems of the test loop, provide cost information for economic analyses, and obtain the heat exchangers for loop heating and cooling, to be installed at Sandia National Laboratory.
- Abengoa Solar would provide power cycle and CSP system modeling and coordinate the activities of Abener.

Echogen/Dresser-Rand would conduct the following:

- Design and fabrication of the turbine, compressor, and test loop

The University of Wisconsin, at Madison would conduct the following activities:

- Corrosion testing using high pressure CO₂

Barber-Nichols would conduct the following activities:

- Engineering consulting regarding turbomachinery design

EPRI would conduct the following:

- System modeling and market analysis

All proposed activities under this project, with the exception of activities at Sandia National Laboratories, would occur at existing facilities utilizing existing equipment and processes. Therefore, no impacts to endangered or threatened species, critical habitat, other protected species, historic and cultural resources, floodplains, wetlands, or prime farmlands, are anticipated. De minimis air pollutant emissions may be generated during this proposed project, therefore exhaust hoods would be used to capture any emissions from chemicals and gasses. Proper air emissions abatement equipment is installed and operational at the affect facilities and all air emissions would be in accordance with applicable federal, state, and local air quality regulations.

NREL and its subcontractors have completed a consolidated R&D questionnaire addressing the protocols for laboratory safety, risk management, chemical handling and waste disposal, which is uploaded to the PMC database. All facilities comply with standard laboratory safety procedures and have appropriate safety equipment available in all laboratory spaces proposed to be utilized during this project. All have applicable federal, state, and local environmental permits in place, and no additional permits or permit modification would be required. All of the facilities have established general safety program and procedures, which would be followed, and all have assigned safety managers.

Based on review of the project information and the above analysis, DOE has determined the research and prototype development would not have a significant individual or cumulative impact to human health and/or environment. DOE has determined the proposed project is consistent with the actions contained in DOE categorical exclusion A9 "information gathering, analysis, and dissemination," and B5.15 "small-scale renewable energy research and development and pilot projects," and is categorically excluded from further NEPA review.

For all work conducted at Sandia National Laboratories, project activities may be subject to additional NEPA review by the cognizant NEPA Compliance Officer at Sandia National Laboratories.

NEPA PROVISION

DOE has made a final NEPA determination for this award

Insert the following language in the award:

If you intend to make changes to the scope or objective of your project you are required to contact the Project Officer identified in Block 11 of the Notice of Financial Assistance Award before proceeding. You must receive notification of approval from the DOE Contracting Officer prior to commencing with work beyond that currently approved.

Note to Specialist :

EF2a prepared by Rob Smith on 10/26/2012.

SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature: _____

Electronically
Signed By: Lori Gray
NEPA Compliance Officer

Date: 10/30/2012

FIELD OFFICE MANAGER DETERMINATION