

# DOE-ID NEPA CX DETERMINATION

**SECTION A. Project Title: Fundamental Study of Key Issues Related to Advanced S-CO<sub>2</sub> Brayton Cycle: Prototypic HX Development and Cavitation - Georgia Institute of Technology**

**SECTION B. Project Description**

Georgia Institute of Technology will perform research (integrated experimental, numerical and analytical work) that utilizes the existing facilities at the university to address the key scientific and operational issues pertinent to the compact heat exchanger systems and turbo-machinery. The specific objectives are:

1. Perform fundamental study of supercritical carbon dioxide (s-CO<sub>2</sub>) cavitation near the critical point. The goal of this task will be to study the possible effects of cavitation on the turbo-machinery components due to the operation near saturation condition and possible transients resulting from vapor production and collapse in the turbine and compressor.
2. Perform heat transfer and pressure drop measurements in various compact heat exchanger designs for working fluids under different operating conditions. We will perform finite element analysis for the optimized design to understand the thermal stresses under various transient conditions. The overarching goal of this task will be develop road map (designs) for the commercially feasible diffusion bonded/brazed compact heat exchanger or competing optimized alternate heat exchanger technology for recuperators.
3. Evaluation of the alternate bonding technology applied to the optimized heat exchanger manufacturing. In this task, in addition to diffusion bonded parts, high temperature brazed systems will also be studied to determine their effectiveness for operation in s-CO<sub>2</sub> heat exchanger systems.

**SECTION C. Environmental Aspects / Potential Sources of Impact**

The action will not create additional environmental impacts above those already occurring at the university.

**SECTION D. Determine the Level of Environmental Review (or Documentation) and Reference(s):** Identify the applicable categorical exclusion from 10 CFR 1021, Appendix B, give the appropriate justification, and the approval date.

Note: For Categorical Exclusions (CXs) the proposed action must not: 1) threaten a violation of applicable statutory, regulatory, or permit requirements for environmental, safety, and health, including requirements of DOE orders; 2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities; 3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; 4) adversely affect environmentally sensitive resources. In addition, no extraordinary circumstances related to the proposal exist which would affect the significance of the action, and the action is not "connected" nor "related" (40 CFR 1508.25(a)(1) and (2), respectively) to other actions with potentially or cumulatively significant impacts.

References: B3.6 Siting, construction, modification, operation, and decommissioning of facilities for small-scale 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 development.

Justification: The activity consists of conducting university laboratory scale research.

Is the project funded by the American Recovery and Reinvestment Act of 2009 (Recovery Act)  Yes  No

Approved by Jack Depperschmidt, DOE-ID NEPA Compliance Officer on 08/12/2014