U.S. Department of Energy
Categorical Exclusion Determination Form

Program or Field Office: Advanced Research Projects Agency - Energy (ARPA-E)

Project Title: 25A4592 - Electric field swing adsorption for carbon capture applications

Location: Pennsylvania

Proposed Action or Project Description: American Recovery and Reinvestment Act: ☒

We propose a novel technology, electric field swing adsorption (EFSA), for the reversible adsorption/desorption of gases using electrically conducting high-surface area solid sorbents. The technique uses applied electric potentials (up to 1 kV) to control the surface interaction between gas molecules and an electrically conducting sorbent material, such as nanoporous carbon. The key transformative aspect of EFSA is that it alters the thermodynamic properties of the sorbent material itself, allowing selection of adsorption or desorption behavior across a wide range of conditions (temperature, pressure, concentration), which may be more difficult or costly to change. Our target application for this technology is carbon dioxide capture from point sources such as coal-fired power plants, where the energy efficiency of the EFSA technique has the potential for drastically reduced parasitic load compared with current carbon capture methodologies, which could significantly lower the cost of carbon-free electrical power in the short term. A key technical objective is the exploration of the influence of electric fields on the gas sorption properties of electrically conducting high surface area carbon sorbents. We will explore first in how far electric bias alone is able to modify gas adsorption properties reversibly and then investigate further options of improvement by advanced sorbent and electrode designs that will create high field strengths and strong field gradients. We aim at the determination of the fundamental energetic and kinetic parameters under which the

Categorical Exclusion(s) Applied:

X - B3.6 Siting/construction/operation/decommissioning of facilities for bench-scale research, conventional laboratory operations, small-scale research and development and pilot projects

*-For the complete DOE National Environmental Policy Act regulations regarding categorical exclusions, see Subpart D of 10 CFR10 21 Click Here

This action would not: threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, including DOE and/or Executive Orders; require siting, construction, or major expansion of waste storage, disposal, recovery, or treatment facilities, but may include such categorically excluded facilities; 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; or adversely affect environmentally sensitive resources (including but not limited to those listed in paragraph B.(4)) of Appendix B to Subpart D of 10 CFR 1021). Furthermore, there are no extraordinary circumstances related to this action that may affect the significance of the environmental effects of the action; this action is not "connected" to other actions with potentially significant impacts, is not related to other proposed actions with cumulatively significant impacts, and is not precluded by 40 CFR 1506.1 or 10 CFR 1021.211.

Based on my review of information conveyed to me and in my possession (or attached) concerning the proposed action, as NEPA Compliance Officer (as authorized under DOE Order 451.1B), I have determined that the proposed action fits within the specified class(es) of action, the other regulatory requirements set forth above are met, and the proposed action is hereby categorically excluded from further NEPA review.

NEPA Compliance Officer: /s/ William J. Bierbower Digitally signed by William J. Bierbower DN: cn=William J. Bierbower, o, ou, email=william.bierbower@hq.doe.gov, c=US Date: 2009.12.15 15:46:07 -05'00' Date Determined: 12/15/2009

Comments: Webmaster:

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