



# U.S. Department of Energy

## Categorical Exclusion Determination Form

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

**Project Title:** 25A2685 - Planar Na-beta Batteries for Renewable Integration and Grid Applications

**Location:** \*- Multiple States - Missouri, Washington

**Proposed Action or Project Description:**

American Recovery and Reinvestment Act:

Widespread penetration of renewable energy and increasing demands on reliability/security of the electrical grid require extensive advances in energy storage technologies that are modular and scalable (kW-MW). Among the most promising technologies is the sodium-beta battery (NBB) based on Na<sup>+</sup> conducting beta-alumina (β<sup>-</sup>-Al<sub>2</sub>O<sub>3</sub>) electrolytes and operated at elevated temperatures (300-350°C). These batteries have demonstrated round-trip efficiencies >90%, storage capacity up to MWhs for hours of duration, and millisecond response times. However, current (NBB), constructed with 1-3 millimeter thick, tubular, electrolytes, have high capital cost, performance/safety issues, and high temperature operation (300-350°C) that limit widespread adoption of this technology into the market. Here we propose to develop and demonstrate a modular sodium β<sup>-</sup>-alumina battery technology that can meet the rigorous performance and cost metrics required for widespread renewable energy integration and electrical grid applications. The new generation NBBs are built upon a planar β<sup>-</sup>-Al<sub>2</sub>O<sub>3</sub> based electrolyte and operated at reduced temperatures (≤250°C) facilitated by optimized electrodes and stack components. Simulations and preliminary experiments show that radical new planar cell designs could overcome performance/cost inadequacies that limit existing tubular systems. A scalable, planar, 5 kW Na-beta battery that operates below 250°C with greater power and volumetric energy densities will be developed at the end of program.

**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 CFR 10 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  
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Date Determined: 01/15/2010

Comments:

Webmaster:



## 25A2685 - Proposed Action or Project Description (Continued)

operates below 250°C with greater power and volumetric energy densities will be developed at the end of program.

To accomplish the proposed goal, EaglePicher Technologies, Inc. (EPT), a leading battery developer, is teaming with Pacific Northwest National Laboratory (PNNL), a world leader in research and development in solid state electrochemistry and energy conversion technologies. The new generation Na-beta batteries will be developed utilizing EPT's formidable expertise in systems design and manufacture, and PNNL's extensive capability and experience in the development of planar solid oxide fuel cells (SOFCs). The program will leverage the experience from both the successful demonstration of a planar design Na-S cell by EPT and performance trends demonstrated in planar SOFC at PNNL to meet the goals of the program. The team setup allows for direct transition of research and development to production of the new Na-beta technologies after successful completion of proposed project. The outcome of this project will have direct impact on establishing US leadership in stationary storage, and will demonstrate a competitive path to cost effective electrical energy storage (EES) required for renewables integration and future grid applications. Analysis indicates that wide applications of the technology can lead to 26% lower life-cycle costs and reduction of 150 million tons per year in total GHG emissions.