PMC-ND

(1.08.09.13)

U.S. DEPARTMENT OF ENERGY OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY NEPA DETERMINATION



RECIPIENT: Northwestern University

STATE: L

PROJECT TITLE : Replacing Cerium with Energy-Efficient Mischmetal in Cast Aluminum Alloys for Aerospace Applications

Funding Opportunity Announcement NumberProcurement Instrument NumberNEPA Control NumberCID NumberDE-FOA-0002553 FY21DE-EE0010221GFO-0010221-001

Based on my review of the information concerning the proposed action, as NEPA Compliance Officer (authorized under DOE Policy 451.1), 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.)
B3.6 Small- scale research and development, laboratory operations, and pilot projects	Siting, construction, modification, operation, and decommissioning of facilities for smallscale 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 deployment.

Rationale for determination:

The U.S. Department of Energy (DOE) is proposing to provide funding to Northwestern University (NU) to discern if mischmetal, a novel aluminum-cerium-lanthanum-based alloy whose energy-footprint is lower than current alloys, can successfully replace the use of heavy titanium-based aerospace parts. This NEPA determination is applicable to all three Budget Periods.

The project work that would occur during all three Budget Periods of the project include: 1) Alloy Development; NU will develop novel aluminum-cerium-lanthanum-based cast alloys, where pure cerium (Ce) is replaced by a mischmetal alloy which is less costly and more energy-efficient to produce from ore, than pure Ce. Strengthening of the new mischmetal alloys via magnesium (Mg) and nickel (Ni) additions will be investigated and an appropriate final complex of Al-Ce-La-Ni-Mg eutectic alloy with outstanding coarsening and creep resistance will be selected. 2) Alloy Mechanical Testing and Part Design; NU will then evaluate the mechanical properties for all cast and heat-treated alloys at ambient and elevated temperatures. NU will then redesign the aerospace part for the final Al alloy, modifying it from its original titanium alloy. 3) Part Performance; Lastly, NU will cast one or more aerospace parts with the final alloy and test their performance in terms of (a) alloy/part microstructure, (b) alloy/part mechanical properties at ambient and elevated temperature, and (c) reduction in energy and CO2 emissions for the production and operation of the part.

Project work activities will be occurring at the following locations:

Northwestern University, Evanston, IL

- Casting, heat-treatment, mechanical testing, and microstructural investigation of AI alloy specimens and parts

Eck Industries (Sub-recipient), Manitowoc, WI - Casting of Al alloy specimens and parts

Boeing Research and Technology (Sub-recipient), Berkeley, MO - Mechanical testing and microstructural investigation of Al alloy specimens and parts

The project would involve the use and handling of small quantities of industrial solvents as well as various metals. All such handling would occur in-lab and each location is dedicated to proper hazardous materials handling and disposal

practices. All hazardous materials would be managed in accordance with federal, state, and local environmental regulations. Existing corporate health and safety policies and procedures would be followed at all locations above, including employee training, proper protective equipment, engineering controls, monitoring, and internal assessments. All project work would be performed at existing, purpose-built laboratory or manufacturing facilities. No modifications to existing facilities, ground disturbing activities, or changes to the use, mission, or operation of existing facilities would be required. No additional permits, licenses, or authorizations would be required.

NEPA PROVISION

DOE has made a final NEPA determination.

Notes:

Advanced Manufacturing Office NEPA review completed by Andrew M. Montano, 10/3/2022

FOR CATEGORICAL EXCLUSION DETERMINATIONS

The proposed action (or the part of the proposal defined in the Rationale above) fits within a class of actions that is listed in Appendix A or B to 10 CFR Part 1021, Subpart D. To fit within the classes of actions listed in 10 CFR Part 1021, Subpart D, Appendix B, a proposal must be one that would not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environment, safety, and health, or similar requirements of DOE or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment facilities (including incinerators), but the proposal may include categorically excluded waste storage, disposal, recovery, or treatment actions or facilities; (3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that preexist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources, including, but not limited to, those listed in paragraph B(4) of 10 CFR Part 1021, Subpart D, Appendix B; (5) involve genetically engineered organisms, synthetic biology, governmentally designated noxious weeds, or invasive species, unless the proposed activity would be contained or confined in a manner designed and operated to prevent unauthorized release into the environment and conducted in accordance with applicable requirements, such as those listed in paragraph B(5) of 10 CFR Part 1021, Subpart D, Appendix B.

There are no extraordinary circumstances related to the proposed action that may affect the significance of the environmental effects of the proposal.

The proposed action has not been segmented to meet the definition of a categorical exclusion. This proposal is not connected to other actions with potentially significant impacts (40 CFR 1508.25(a)(1)), is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1508.27(b)(7)), and is not precluded by 40 CFR 1506.1 or 10 CFR 1021.211 concerning limitations on actions during preparation of an environmental impact statement.

The proposed action is categorically excluded from further NEPA review.

SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature:

Rectronically Signed By: Casey Strickland NEPA Compliance Officer

Date: 10/4/2022

FIELD OFFICE MANAGER DETERMINATION

- Field Office Manager review not required
- ☐ Field Office Manager review required

BASED ON MY REVIEW I CONCUR WITH THE DETERMINATION OF THE NCO :

Field Office Manager's Signature:

Field Office Manager

Date: