

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



**RECIPIENT:** University of Washington

**STATE:** WA

**PROJECT TITLE :** Acoustic Field-Assisted Additive Manufacturing for Structured Electrode Lithium-ion Batteries: Reliability Characterization and Scale-up

<b>Funding Opportunity Announcement Number</b>	<b>Procurement Instrument Number</b>	<b>NEPA Control Number</b>	<b>CID Number</b>
DE-FOA-0002553	DE-EE0010226	GFO-0010226-001	GO10226

**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 the University of Washington to design, develop, fabricate, and test acoustic chambers which would be used to fabricate Lithium-ion battery structured electrodes. The project would be completed over three Budget Periods (BPs) with a Go/No-Go decision point between each BP. This NEPA determination is applicable to all three BPs.

Participants would develop a manufacturing process that would use acoustic waves in an acoustic field to assemble particles in a fluid on a micron-scale. The design for a structured electrode would be used to inform the design and scale-up of the acoustic chamber from a mm-scale to cm-scale processing system. The prototype would be optimized and further scaled-up for reliable structured electrode processing.

Proposed project activities would take place in the following dedicated laboratory facilities:

University of Washington, Molecular Engineering and Sciences Building – Seattle, WA

- Design, development, fabrication, and testing of acoustic chambers and associated acoustic chamber hardware in addition to processing, fabrication, and testing of Lithium-ion battery inks and Lithium-ion battery structured electrode cells.

University of California, Santa Barbara – Santa Barbara, CA

Engineering II Building

- Development, fabrication, and testing of acoustic chamber hardware.
- Characterization of patterned components using optical microscopy.

Materials Research Laboratory

- Physical property characterization (e.g., microscopy and rheological measurements).

Microfluidics Fabrication Facility

- Fabrication of sub-components of acoustic chambers using laser cutters, commercial 3D polymer printers, and other basic shop tools.

#### Microscopy and Microanalysis Facility

- Characterization of patterned components via electron microscopy.

#### Oak Ridge National Laboratory, Compute and Data Environment for Science – Oak Ridge, TN

- Computational modeling.

#### Arkema Inc. Research Center – King of Prussia, PA

- Binder synthesis, characterization and testing, electrode formulation and casting, electrode fabrication, and testing in functional cells.
- Testing and performance evaluation.

No changes in the use, mission, or operation of existing facilities would be required as part of this project and no additional permits would be required in order to conduct any of the work activities. Project activities would involve the use and handling of various non-hazardous and hazardous materials including Lithium-ion battery powders, carbon materials, binder polymers, and battery electrolytes and solvents. Any risks associated with the handling of these materials would be mitigated through adherence to established health and safety policies and procedures including personnel training, the use of personal protective equipment, engineering controls, and environmental health and safety assessments. All waste products would be disposed of by licensed waste management service providers. The University of Washington and its project partners would observe all applicable federal, state, and local health, safety, and environmental regulations.

Any work proposed to be conducted at a federal facility may be subject to additional NEPA review by the cognizant federal official and must meet the applicable health and safety requirements of the facility.

### NEPA PROVISION

DOE has made a final NEPA determination.

Notes:

Advanced Manufacturing Office  
Review completed by Shaina Aguilar on 1/5/23.

### 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: \_\_\_\_\_

 Electronically  
Signed By: **Casey Strickland**

NEPA Compliance Officer

Date: 1/6/2023

**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: \_\_\_\_\_