

**U.S. Department of Energy- Idaho Operations Office**  
**National Environmental Policy Act**  
**Categorical Exclusion Determination**

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Categorical Exclusion Posting No.: DOE-ID-INL-25-046

**Project Title:** Advanced Chemistry, Energy, and Critical Materials Research for Integrated Forward Deployment, Expeditionary Manufacturing, Domestic Resource Security

**Project Description and Purpose:**

The Idaho National Laboratory (INL) is partnering with the U.S. Army Combat Capabilities Development Command (DEVCOM) and the Colorado School of Mines to support the development of new technologies and manufacturing protocols for the Department of Defense (DoD). This project focuses on improving chemistry and energy generation in various environments, establishing mobile manufacturing bases, and developing domestic industrial capabilities using novel processes and materials. The project will enhance the effectiveness of soldiers, improve supply logistics, and bolster U.S. manufacturing capabilities. This project will advance the capabilities of the U.S. Army in various operational environments, enhance domestic manufacturing, and provide significant societal benefits through improved technologies and processes. The research will partner with Colorado School of Mines, American Engineering and Recycling, and Advanced Photon Source at Argonne National Laboratory. The Colorado School of Mines conducts electrocatalysis experiments and on-site characterization, while American Engineering and Recycling focuses on Li-ion battery recycling. Additionally, the Advanced Photon Source at Argonne National Laboratory performs X-ray absorption spectroscopy experiments.

The work will be conducted at the following INL facilities:

- Energy Innovation Laboratory (EIL)
- Energy Systems Laboratory (ESL)
- Critical Materials & Energy Systems Innovation Center (CMESIC)
- INL Research Center (IRC)

Off-site work will be performed at:

- Colorado School of Mines in Golden, Colorado
- American Engineering and Recycling in Boulder, Colorado
- Advanced Photon Source at Argonne National Laboratory in Illinois

**Tasks:**

**Category 1: Biologically Enhanced Processes for Zero Resupply Dismounted Soldiers**

- Task 1.1: Agile Bioreactor Development (INL)
  - Develop bioreactors to produce chemicals from various sources for military use at IRC. This work will involve the use of genetically modified organisms. Some organisms may be genetically engineered organisms (GEO).
- Task 1.2: Bio-Hybrid Electrocatalytic Reactors (Colorado School of Mines and INL)
  - Design catalysts that consist of metal and metal oxide nanoparticles to convert precursor chemistries and streams from bioreactors into useful compounds at EIL and Colorado School of Mines facilities using electroconversion processes.
- Task 1.3: Biomass Sorting and Pretreatment (INL)
  - Create mobile platforms for sorting and processing waste biomass in the field.
- Task 1.4: Biomass Derived Structural Materials (INL)
  - Develop materials from biomass for use in 3D printing and building applications at ESL.
- Task 1.5: Radiophile Engineering (INL)
  - Engineer microbes to produce chemicals in high radiation environments at IRC. This work will involve the use of genetically modified organisms. Some organisms may be genetically engineered organisms (GEO).

**Category 2: Domestic Critical Materials Sustainment**

- Task 2.1: Electrolysis Cell for Free Radical Chemistry (Colorado School of Mines)
  - Design cells to generate reactive species for processing mineral components with possible generation of nanomaterials done at approved nanomaterial handling laboratories at EIL.
- Task 2.2: Biologically Mediated Recovery of Critical Materials (Colorado School of Mines)
  - Develop microbes to extract critical materials from product streams at IRC.
- Task 2.3: Zero-Waste Li-Ion Battery Recovery/Repurposing (Colorado School of Mines, American Engineering and Recycling)

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- Create a platform to recycle and repurpose end-of-life lithium-ion batteries at EIL. This work will involve the use of genetically modified organisms. Some organisms may be genetically engineered organisms (GEO).
- Task 2.4: Molten Salt Electrolysis for Critical Materials Recovery/Separations (INL)
  - Develop electrolysis cells for metallizing rare earth metals at EIL.
- Task 2.5: Electrophoretic & Capacitive Separations of Critical Metals (Colorado School of Mines)
  - Use electrophoresis to separate metals from complex solutions at EIL.
- Task 2.6: Waste to Carbon-Based Materials (Colorado School of Mines)
  - Convert waste materials into carbon-based products like graphite and carbon fibers with possible generation of nanomaterials done at approved nanomaterial handling laboratories at EIL.
- Task 2.7: Critical Materials Supply Chain Analysis and Feasibility (INL)
  - Conduct supply chain and economic analyses for critical materials.

**Category 3: Energy Sustainment in Austere Environments**

- Task 3.1: Deployable Microgrids for Austere Environments (INL)
  - Optimize microgrid platforms for military applications in various geographic locations at ESL.
- Task 3.2: Energy Vehicle Solutions in Forward Deployed Scenarios (INL)
  - Develop ruggedized energy storage solutions and charging stations for electric vehicles at ESL.
- Task 3.3: Hydrogen Generation in Austere Environments (INL)
  - Engineer electrolysis platforms to produce hydrogen and other fuels in remote locations at ESL.

**Category 4: Advanced Manufacturing for Defense Materials**

- Task 4.1: Electric Field Assisted Sintering (EFAS) (INL)
  - Develop advanced ceramics and metals using EFAS techniques at ESL.
- Task 4.2: Additive Manufacturing of Metals and Ceramics (INL)
  - Support the additive manufacturing of metals and ceramics for military use at ESL.
- Task 4.4: Printable Sensors in Austere Environments (INL)
  - Create printable sensors for various military applications performed at IRC.

Equipment to be purchased includes bioreactors, IR spectrometer, electrolysis cells, electrophoresis cell, and metal 3D printer.

Samples such as battery materials that include lithium carbonate, graphite, black mass (cobalt and nickel), metal casing from American Engineering and Recycling will be sent to INL for testing. Samples will be collected and managed by WGS.

**Waste Details:**

INL:

- EIL, IRC, ESL, CMESIC
  - Industrial: general nonhazardous waste ~ 20 lbs.
  - Hazardous: Acid solutions, alkaline solutions, Oleyamine, oleic acid, acetone, ethanol, isopropyl alcohol, glycerol, sample waste such as batteries.
  - Nanoparticle waste ~ 5 lbs (diluted in water, or on electrode materials at very low weight %).
  - Genetically modified organisms ~ 20 lbs (diluted in water).
  - PPE and wipes: Eye protection, lab coats, gloves, Kimwipes ~10 lbs.
- IRC
  - Radioactive Low Level Waste (LLW): 100 mg of low concentration uranium at a one time maximum generation.
  - Waste may be a mixture of CH-LLW and RH-LLW, the PPE and wipes may be mixed waste or hazardous waste because of chemical contamination.

Waste generated during the project will be disposed of by the Waste Generator Services (WGS). All waste will be packaged and dispositioned in accordance with BEA Waste Management Program (WMP) requirements, with assistance from the WMP's Waste Generation Services (WGS) subcontractor.

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Nanomaterials will be handled according to appropriate INL work control procedures and in a designated High Efficiency Particulate Air (HEPA)-filtered fume hood for storage space or within a glove box space (for air-sensitive compounds) which are compliant with INL's nano-work regulations.

Colorado School of Mines

- Generates aqueous chemical waste.

American Engineering and Recycling

- Generates recovered battery materials.

Advanced Photon Source at Argonne National Laboratory

- Generates aqueous chemical waste.

All waste will be managed in compliance with local, state, federal, and international regulations as required by contractual agreements.

**Environmental Aspects or Potential Sources of Impact:**

**Air Emissions**

Nanomaterials will be handled according to appropriate INL work control procedures and in a designated High Efficiency Particulate Air (HEPA)-filtered fume hood for storage space or within a glove box space (for air-sensitive compounds) which are compliant with INL's nano-work regulations.

**Discharging to Surface-, Storm-, or Ground Water**

NA

**Disturbing Cultural or Biological Resources**

CULTURAL RESOURCES: Pursuant to the 2023 Programmatic Agreement as amended in 2025, the proposed actions at the INL do not meet the threshold of a federal undertaking with the potential to affect historic properties and will have no effect to historic properties. However, actions are also planned for off-site, and INL is providing support for the project effort, only. Refer to Hold Points.

**Generating and Managing Waste**

When wastes are generated, how they are disposed can adversely affect the environment. Managing wastes appropriately and responsibly and implementing recycling or reuse practices, where feasible, during project activities can reduce the potential impact on the environment.

Nanomaterials will be handled according to appropriate INL work control procedures. Genetically modified organisms will be handled according to appropriate INL Work control procedures.

**Releasing Contaminants**

When chemicals are used during the project there is the potential for spills that could impact the environment (air, water, soil).

**Using, Reusing, and Conserving Natural Resources**

Project activities have the opportunity to reduce the impact on our natural resources by recycling or diverting materials from disposal in the landfill.

**Determination**

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, or similar requirements of Department of Energy (DOE) or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment or facilities; (3) disturb hazardous substances, pollutants, contaminants, or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources (see 10 CFR 1021); (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

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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, Appendix B. The proposal has not been segmented to meet the definition of a categorical exclusion. Segmentation can occur when a proposal is broken down into small parts in order to avoid the appearance of significance of the total action. However, segmentation does not include proposals that are developed and potentially implemented over multiple phases where each phase results in a decision whether to proceed to the subsequent phase. There is no extraordinary circumstance related to the proposal that is likely to cause a reasonably foreseeable significant adverse effect or for which DOE does not know the environmental effect. Extraordinary circumstances are unique situations presented by specific proposals, including, but not limited to, scientific controversy about the environmental effects of the proposal; uncertain effects or effects involving unique or unknown risks; and unresolved conflicts concerning alternative uses of available resources.

**References:** B3.6 "Small-scale research and development, laboratory operations, and pilot projects"

**Justification:** For the DOE regulations regarding the application of categorical exclusions, including the full text of each categorical exclusion, see 10 CFR 1021.102 and Appendix B to 10 CFR Part 1021. Implementing guidance for categorical exclusions can be found in DOE's National Environmental Policy Act Implementing Procedures (June 30, 2025): (See full text in regulations and implementing procedures).

The proposal must fit within the classes of actions listed in Appendix B to 10 CFR Part 1021 and must satisfy the conditions that are integral elements of the classes of actions therein.

There are no extraordinary circumstances related to the proposal that may affect the significance of the environmental effects of the proposal. DOE or an applicant may modify the proposal to avoid reasonably foreseeable adverse significant effects such that the categorical exclusion would apply.

The proposal has not been segmented to meet the definition of a categorical exclusion.

B3.6 Small-scale research and development, laboratory operations, and pilot projects. 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 deployment.

Approved by Robert Herzog, DOE-ID NEPA Compliance Officer on: 12/9/2025