Project Title: Clean Core Thorium Energy (CCTE) ANEEL TREAT 1 Irradiation Experiment R2

Project Description and Purpose:

Revision 2:

This project, led by Clean Core Thorium Energy (CCTE) in partnership with Idaho National Laboratory (INL), aims to develop and test a novel nuclear fuel named Advanced Nuclear Energy for Enriched Life (ANEEL). The ANEEL fuel is designed for use in CANDU (Canadian Deuterium Uranium) reactors and combines uranium and thorium to extend fuel life.

INL will execute a transient irradiation experiment on Advanced Test Reactor (ATR)-irradiated ANEEL fuel, covering the full lifecycle from planning through post-irradiation examination (PIE). The work begins with defining test requirements, constraints, and supporting out-of-pile testing, followed by selection of the final testing configuration. INL will then perform experiment design activities, progressing from pre-conceptual through final design to establish feasibility, materials, and system integration. Following design, INL will fabricate, assemble, and qualify all experiment components, including hardware and instrumentation, ensuring readiness for irradiation. The experiment will be conducted at the Transient Reactor Test Facility (TREAT), including preparation, safety reviews, reactor operations, and performance monitoring. Supporting out-of-pile testing may also be conducted to inform and compare results.

After irradiation, materials will be packaged and transported to the Materials and Fuels Complex (MFC) for PIE. Detailed evaluations will be performed at the Hot Fuels Examination Facility (HFEF) and the Irradiated Materials Characterization Laboratory (IMCL) to assess fuel performance. Additional work, including procurement and assembly, will be conducted at the North Holmes Laboratory (NHL). INL will provide overall management and coordination of technical scope, schedule, cost, and risk to ensure successful execution. Only INL personnel are involved in this project, with no participation from other agencies.

Waste generation will include the following:

- Industrial waste: Up to 1 pound of structural material from fabrication.
- Hazardous waste: Approximately 1 cubic meter of chemicals (e.g., acetone) used for cleaning.
- Radioactive waste: Up to 20-30 kg of irradiated sample debris and secondary waste from TREAT and MFC.
- Approximately 1 cubic foot of low-level waste (PPE, towels).
- Approximately 1 cubic foot of sodium-contaminated mixed waste.
- Research and development-related transuranic (TRU) waste and mixed TRU waste, expected to be less than 129 cubic centimeters.

All waste will be managed in accordance with INL's established practices and regulatory requirements.

The samples that will be taken will be the ATR fuel pins. The samples will be treated as waste after PIE and will be disposed of.

Revision 1:

This revision provides a better sequence of tasks in the research now that the conceptual design and analysis has been completed.

The ANEEL irradiation test will be performed in the ATR. The first phase of work completed under CRADA-20CRA22 was conceptual design and analysis. Under this new agreement, INL outlines the subsequent execution phases which INL will complete. The high-level phase descriptions include: the preliminary and final design of the irradiation test, fabrication of required testing and handling hardware, assembly of the experiment test specimens and associated hardware, irradiation of the fuel at ATR, and subsequent post irradiation examination (PIE) at MFC (or other suitable facilities at INL). Each subphase of this scope of work will have specific deliverables and requirements to be able to continue to subsequent tasks detailed below.

There are three fuel compositions planned for irradiation with varying uranium oxide to thorium oxide ratios. Some of the specimens are also planned to contain small amount (less than a few weight percent) of burnable absorber. A fourth set of specimens is planned to use only uranium oxide as a control group. The uranium constituent of all specimens will be low enriched uranium as provided by Idaho National Laboratory. The fuel pellets will be arranged into 12 rodlets, each having ~ 4 inch fuel stacks, and clad in zirconium alloy. Each rodlet will be encapsulated in stainless steel during irradiation.

Fabrication and assembly will occur at North Holmes Laboratory (NHL), the Advanced Fuels Facility (AFF), the Experimental Fuels Facility (EFF), and Fuels and Applied Science Building (FASB). Irradiation will occur at the Advanced Test Reactor (ATR). Post irradiation examination (PIE) will occur at the Hot Fuel Examination Facility (HFEF) and the Irradiiated Material Characterization Laboratory (IMCL).

Tasks

Tasks 1: Complete INL Irradiation Test Preliminary Design.

Complete all activities and requirements to meet preliminary design per the INL Nuclear Materials Experiments Execution Process.

Task 2: Complete Final Design and Analysis. Begin Long Lead Fabrication.

Complete all activities and requirements to meet final design per the INL Nuclear Materials Experiments Execution Process.

Task 3: Fabricate Experiment Hardware and Fuel Acceptance.

Procure and fabricate all materials, hardware, etc. to perform the irradiation test. This includes weld development and qualification. Fuel will be provided by CCTE from TAMU to the specifications developed under phase 1. INL will develop a fuel inspection plan to include review of fabrication and inspection documentation, non-destructive inspection, and destructive analysis of a representative sample of fuel pellets. Additionally, a dissolution process will be developed to facilitate chemical and isotopic analyses. Fuel pellets will be loaded/welded into metallic tubes to create clad rodlets inside of capsules. Capsule will be loaded into open-top irradiation baskets to support their irradiation in ATR.

Task 4: Irradiate Fuel.

Perform irradiation of the fuel test train per the irradiation test plan. It is anticipated the irradiation will last 4-5 standard ATR cycles. The irradiated samples will be shipped to HFEF for PIE.

Task 5: Post Irradiation Examination.

Perform initial post irradiation examination. Anticipated scope is as follows:

Non-Destructive Exam (on all rods)

- Visual inspection – general condition of rod (especially damage or distortion of cladding)
- Neutron radiography (2 shots at 90º angles) – general condition of fuel (including the central void)
- Axial gamma scan – distribution of radionuclides (used as a measure of local burnup and radionuclide transport within the rodlet)
- Profilometry – dimensional change in the cladding (measure of the pellet growth and interaction with the cladding)

Destructive Exams (start with all high burnup rods and examine lower burnup rods as necessary – assume 1/3 of rodlets examined)

- Rod puncture w/ plenum volume, gas pressure, and gas composition analysis – measure fission gas release
- Optical microscopy including image analysis – evaluate microstructural performance of the fuel (cracking, fission gas bubble evolution, fuel swelling, fuel-cladding interaction, etc.)

Original ECP:

Purpose and Background:

Clean Core Thorium Energy (CCTE), LLC (Clean Core), located in Oak Brook, Illinois, is committed to the development of alternative nuclear fuels. CCTE is focused on development of Thorium-based fuels for Pressurized Heavy-Water Reactors (PHWR) / Canada Deuterium Uranium (CANDU) reactors. Thorium based nuclear fuels are a promising alternative to Uranium based fuels. Thorium is approximately three times more abundant in nature compared to Uranium and occurs mainly as the 'fertile' 232Th isotope. There is an immense potential as a result of the 'breeding' of the fissionable isotope 233U from 232Th, and several experiment and prototype reactors were successfully operated during the mid-1950s through the mid-1970s using Thorium-based fuels. Presently, Thorium based fuels have not been introduced commercially for various reasons, but primarily, estimated Uranium resources have turned out to be sufficient. There is a renewed interest in Thorium based fuels because of its intrinsic proliferation resistance due to the presence of 232U and its strong gamma emitting daughter products, its better thermo-physical properties and chemical stability relative to UO2 which ensures better in-pile performance and a more stable waste form, and its irradiated fuel contains far less long lived minor actinides than do fuels in the traditional Uranium fuel cycle. The experiment design and irradiation campaign summarized below is fulfilling a critical step in the development and potentially licensing of alternative nuclear fuels that offer much relative to the traditional Uranium fuel cycle.

Idaho National Laboratory (INL) is the nation's lead laboratory for nuclear energy research, development, demonstration, and deployment. INL's Advanced Test Reactor (ATR) and Materials and Fuels Complex (MFC) facilities are required to accomplish the tasks for this project and are discussed below.

The overall project objective of the Parties is to investigate the performance of high burnup "Advanced Nuclear Energy for Enriched Life (ANEEL)" fuel designed by CCTE. The CCTE designed ANEEL fuel is based on (Th,U)O2 in ratios optimized for extended operation in PHWRs/CANDUs.

CCTE has requested INL's support to conduct irradiation testing on mixed thorium-uranium oxide ((Th,U)O2) fuel samples to assess fuel performance. These tests would be conducted as a first step towards development and qualification of the fuel system for intended high burn-up at linear heat generation rates typical of PHWRs and CANDU reactors. INL will perform the design and analysis work to develop an irradiation test rig and its associated safety basis for irradiation in the Advanced Test Reactor (ATR). Fuel pellets will be fabricated at Texas A&M University (TAMU) under a separate agreement between CCTE and TAMU. The fuel specifications for the prototype fuel will be provided by CCTE. INL will provide guidance to TAMU acting on behalf of CCTE regarding fuel qualification and fuel characterization plan. Final rodlet fabrication will be performed by the INL. After the fuel burnup objectives are met in ATR, samples will be transported to MFC and Post-Irradiation Examinations (PIE) will be performed at the Hot Fuel Examination Facility (HFEF).

Irradiation and Conceptual Experiment Design:

The accelerated burnup aspect of this experiment campaign should be interpreted as accelerated with respect to burnup accumulation prototypic of CANDU reactor fuels. The radial dimensions of fuel in this experiment will be approximately 50-60% of those in commercial CANDU reactors to provide the accelerated rate of burnup accumulation. If fuel power is characterized in terms of Linear Heat Generation Rate (LHGR), and if the radial dimensions are scaled uniformly, scaling down by a factor of two while maintaining the same LHGR results in the same temperature distribution with a factor of 4 increase in fuel power density. Simply put, reducing the fuel dimensions by half results in the fuel's rate of burnup accumulation to increase by a factor of 4 if the LHGR can be matched.

At the current point in time, the CCTE experiment design for irradiation in ATR is pre-conceptual. Initial cost estimates allow for 6-10 fueled capsule experiments that are nearly identical to the capsules designed in the Accident Tolerant Fuels drop-in (ATF-1) experiment campaign. Waste streams generated in this activity will be nearly identical to those generated in the Accident Tolerant Fuels campaign (see INL-20-044), yet with far less volume. There are two fuel types requested for irradiation. The first consists of 78 weight percent (wt %) ThO2 and 22 wt % UO2. The second fuel type will include the addition of 0.3 wt % B2O3. All fuel types will target an initial 235U enrichment = 16 wt %. The fuel pellets will be arranged in ~ 4 inch stacks, and clad by Zircaloy-4. The clad fuel specimen is known as a rodlet, and each rodlet will be encapsulated in Grade 316 Stainless Steel.

The first cycle of irradiation will begin in the Spring of 2022 following ATR's Core Internals Changeout (CIC). The number of cycles of irradiation will be determined in future neutronics/physics analyses.

Post Irradiation Examination:

PIE is an essential component of this fuel development effort because it provides nearly all measurements necessary to understand the fuels irradiation performance. The various PIE techniques performed at the Hot Fuels Examination Facility (HFEF) are either destructive or non-destructive to the irradiated materials. The various destructive and non-destructive PIE techniques are summarized below, seriatim.

Blister Anneal Testing (Destructive Technique):

This test requires that the fuel component be heated to the point where the first failure threshold has been reached as indicated by raised areas (blisters) on the surface of the component. This is required for fuel qualification since blistering is conservatively presented as a precursor to a breach of the fuel cladding, the primary containment of the fuel and fission products. Blister anneal testing can be performed in simple furnaces provided the temperatures can reach a maximum of 550°C. This is a destructive examination.

Fission Product Release (Destructive Technique):

Data obtained from fission gas release may be used in the fuel qualification report. The purpose is to identify the failure thresholds and measure fission product release to define the allowable safety margins for monolithic and dispersion fuel utilization. Specifically source term data is determined based on the type and movement of various fission product inventories. These examinations can be performed in a furnace that can accommodate the sample size and that is capable of reaching at least 2000°C. This is a destructive examination.

Metallography (Destructive Technique):

Metallography is both a qualitative and quantitative measure. This is a destructive examination of irradiated materials requiring sectioning and mounting small pieces of the irradiated fuel for examination in the microscope.

Microhardness Testing (Destructive Technique):

Microhardness testing is done on the system installed in the HFEF met box. This is a destructive examination of irradiated materials requiring sectioning and mounting small pieces of the irradiated fuel.

Scanning Electron Microscope (SEM) / Transmission Electron Microscope (TEM) sample preparation at the Irradiated Materials Characterization Laboratory (Destructive Technique):

Some samples may be sectioned and sent to the Irradiated Materials Characterization Laboratory (IMCL) for preparation for and SEM/TEM investigation. A Plasma Focused Ion Beam (PFIB) may be used to mill micrometer sized samples out of larger specimens. This is a destructive examination and requires the IMCL stack monitor operable for potential air emissions.

Disassembly (Non-Destructive Technique):

Disassembly of the capsules is done only to remove the fuel rodlets from the external capsules. Every effort is made to do so without damaging the internal fuel rodlets. A lathe would be used to cut the endcaps off the capsules. The rodlets are then pushed out of the capsule tube using an appropriately sized drill rod. This is non-destructive (to the rodlet) process.

Eddy Current (Oxide, Non-Destructive Technique):

Eddy current measurements are taken to estimate the oxide thickness that has grown on the fuel components. This is a non-destructive examination.

Gamma Scanning (Non-Destructive Technique):

All irradiated experimental components are scanned using the precision gamma scanner (PGS). Gamma scan results are used to determine the relative 2- D fission density gradient over a surface. This is a non-destructive examination.

Immersion Density (Non-Destructive Technique):

Immersion density data provides fuel swelling values for the material. This information is used in the fuel qualification report as a fundamental fuel behavior property. This is a non-destructive examination.

NRAD (Non-Destructive Technique): Neutron radiography is performed to identify any cracking in the fuel foil prior to sectioning. This is a non-destructive examination.

Profilometry (Non-Destructive Technique): Profilometry data is used to determine local fuel swelling and is vital to the fuel qualification report. This is a non-destructive examination.

Visual Examination (Non-Destructive Technique): The visual examinations of materials at HFEF would be performed to identify any anomalies, changes or defects that may have occurred during irradiation or shipping. The examination is performed using a telephoto lens and camera, taking photos through the HFEF hot cell window. Photographs are taken of the front, back, and end of all capsules. This is a non-destructive examination.

Storage and Used Fuel Specification:

After PIE, irradiated test pin segments and PIE remnants will be stored with other similar DOE-owned irradiated materials and experiments at MFC, most likely in the HFEF or the Radioactive Scrap and Waste Facility (RSWF) in accordance with DOE's Programmatic SNF Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement (FEIS) and ROD (DOE/EIS0203, 1995) and supplemental analyses (DOE/EIS-0203-SA-01 and DOE/EIS-0203-SA-02) and the Amended Record of Decision (February 1996). Ultimate disposal of the irradiated test pin segments and PIE remnants will be along with similar DOE-owned irradiated materials and experiments currently at MFC. Categorizing this material as waste is supported under Department of Energy Order (DOE O) 435.1, Att. 1, Item 44, which states "...Test specimens of fissionable material irradiated for research and development purposes only...may be classified as waste and managed in accordance with this Order...".

In addition, to complete proposed work activities, it is necessary for the project to use the HFEF hot cell which contains both defense and nondefense related materials and contamination. Project materials will come into contact with defense related materials. It is impractical to clean out defense related contamination, and therefore, waste associated with project activities is eligible for disposal at the Waste Isolation Pilot Plant (WIPP). National Environmental Policy Act (NEPA) coverage for the transportation and disposal of waste to WIPP are found in Final Waste Management Programmatic Environmental Impact Statement [WM PEIS] (DOE/EIS-0200-F, May 1997) and Waste Isolation Plant Disposal Phase Supplemental EIS (SEIS-II) (DOE/EIS-0026-S-2, Sept. 1997), respectively. The 1990 ROD also stated that a more detailed analysis of the impacts of processing and handling transuranic (TRU) waste at the generator-storage facilities would be conducted. The Department has analyzed transuranic (TRU) waste management activities in the Final Waste Management Programmatic Environmental Impact Statement (WM PEIS) (DOE/EIS-200-F, May 1997). The WM PEIS analyzes environmental impacts at the potential locations of treatment and storage sites for TRU waste; SEIS-II addresses impacts associated with alternative treatment methods, the disposal of TRU waste at WIPP and alternatives to that disposal, and the transportation to WIPP.

Irradiated sample debris and PIE waste are expected to generate research and development-related TRU waste and mixed TRU waste. TRU waste generated for the experiments will be less than 129 cubic centimeters (conservative estimate assuming all UO_2 fuel will be converted to TRU).

Environmental Aspects or Potential Sources of Impact:

Air Emissions

The proposed action has the potential to generate radiological and chemical emissions from irradiation in ATR and the destructive and non-destructive PIE at HFEF. Air emissions are anticipated to be minor, and concentrations would not exceed the current monitored air emissions from these facilities. An Air Permit Applicability Determination (APAD) is required for any work or project causing radiological emissions that are not covered under an existing APAD.

The ATR irradiation activities are not modifications in accordance with Idaho Administrative Procedures Act (IDAPA) 58.01.01.201 and 40 Code of Federal Regulation (CFR) 61 Subpart H. ATR radionuclide emissions are sampled and reported in accordance with Laboratory Wide Procedure (LWP)-8000 and 40 CFR 61 Subpart H. All experiments will be evaluated by Environmental Support and Services staff. All radionuclide release data (isotope specific in curies) directly associated with this proposal will be calculated and provided to the Environmental Support organization.

The irradiated specimens will be delivered to the MFC HFEF for disassembly and then undergo routine PIE. All radionuclide release data associated with the PIE portion of this experiment will be recorded as part of the HFEF continuous stack monitor. The PIE examination in HFEF is not a modification in accordance with Idaho Administrative Procedures Act (IDAPA) 58.01.01.201 and 40 Code of Federal Regulation (CFR) 61 Subpart H. SEM/TEM work will involve sample prep and PFIB at IMCL. This is important as PFIB removes material from the sample in preps for TEM and is required to have the IMCL stack monitor operable for air emissions.

In 2019, the effective dose equivalent to the offsite maximally exposed individual (MEI) from all operations at the INL Site was calculated as 5.59 E-02 mrem/yr, which is 0.56% of the 10-mrem/yr federal standard and was calculated using all sources that emitted radionuclides to the environment from the INL site. The additional increment in emissions from the proposed action would not significantly change the total site-wide MEI dose. Therefore, the emissions are bounded by the analysis in the 1995 EIS, which estimated the annual cumulative doses to the maximally exposed worker, offsite maximally exposed individual (MEI), and the collective population from DOE's decision to implement the preferred alternative (DOE/EIS-0203). The potential air emissions and human health impacts associated with the proposed action would be smaller than and are bounded by the impacts presented in the 1995 EIS.

Discharging to Surface-, Storm-, or Ground Water

NA

Disturbing Cultural or Biological Resources

The ATR Reactor Building (TRA-670) is over 50 years old. No structural or aesthetic changes will be made to the building.

Non-Undertaking

CULTURAL RESOURCES: Pursuant to the 2023 Programmatic Agreement as amended in 2025, the proposed action does not meet the threshold of a federal undertaking with the potential to affect historic properties and will have no effect to historic properties.

Generating and Managing Waste

Irradiated sample debris and PIE waste are expected to generate research and development related TRU waste and mixed TRU waste. TRU waste generated for the experiments will be less than 129 cubic centimeters (conservative estimate assuming all UO2 fuel will be converted to TRU). Categorizing this material as waste is supported under DOE O 435.1, Att. 1, Item 44, which states "…Test specimens of fissionable material irradiated for research and development purposes only…may be classified as waste and managed in accordance with this Order...".

Small amounts of low-level waste would be generated in the form of personal protective equipment (PPE) and towels used for cleaning and polishing.

Project activities would also result in the generation of small amounts of industrial waste.

Project personnel would work with WGS to properly package and transport regulated, hazardous or radioactive material or waste according to laboratory 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 description indicates materials will need to be purchased or used that require sourcing materials from the environment. Being conscientious about the types of materials used could reduce the impact to our natural resources.

SECTION D. Determine Recommended Level of Environmental Review, Identify Reference(s), and State Justification: Identify the applicable categorical exclusion from 10 Code of Federal Regulation (CFR) 1021, Appendix B, give the appropriate justification, and the approval date.

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 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"

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.

Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement and Record of Decision (DOE/EIS-0203, 1995) and supplemental analyses (DOE/EIS-0203-SA-01 and DOE/EIS-0203-SA-02) and the Amended Record of Decision (1996)

Final Environmental Impact Statement for the Waste Isolation Pilot Plant (DOE/EIS-0026, October 1980) and Final Supplement Environmental Impact Statement for the Waste Isolation Pilot Plant (SEIS-I) (DOE/EIS-0026-FS, January 1990)

Final Waste Management Programmatic Environmental Impact Statement [WM PEIS] (DOE/EIS-0200-F, May 1997) and Waste Isolation Plant Disposal Phase Supplemental EIS (SEIS-II) (DOE/EIS-0026-S-2, September 1997)

Final Environmental Impact Statement for the Nevada Test Site and Off-Site Locations in the State of Nevada (DOE/EIS-0243) and supplemental analysis (SA) (DOE/EIS-0243-SA-01)

Final Environmental Assessment and Finding of No Significant Impact for the Replacement Capability for Disposal of Remote- Handled Low-Level Radioactive Waste Generated at the Department of Energy's Idaho Site (DOE/EA-1793, December 2011)

Justification: The proposal fits within the classes of actions listed in Appendix B to 10 CFR Part 1021 or Appendix B and C of DOE's NEPA Implementing Procedures and satisfies the conditions that are integral elements of the classes of actions therein. The proposal does 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, 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, Appendix B.

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.

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.

Based on my review of the proposed action, 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.

Approved by Robert Douglas Herzog, DOE-ID NEPA Compliance Officer on: 6/4/2026