SECTION A. Project Title: I-Loop Deployment in the Advanced Test Reactor R2

SECTION B. Project Description and Purpose:

Revision 2

The I-Loop Boiling Water Reactor (IL-BWR) experiment will irradiate light water reactor (LWR) type fuel in the Advanced Test Reactor (ATR). The experiment will utilize an isolated loop system to allow operation at neutronic, thermal-hydraulic, and chemical boundary conditions representative of commercial LWR nuclear power plants. The fuel pins will be irradiated under normal operating conditions and conditions representative of a bundle dryout transient to simulate return-to-service of impacted fuel pins. Experiment outcomes and post-irradiation examination (PIE) data will be used to investigate performance of fuel and cladding technologies when subjected to boiling water reactor routine and transient operating conditions.

- Prototype Testing: The IL-BWR project scope includes prototype testing in the flowing autoclave at the INL Engineering Demonstration Facility (IEDF) to ensure that the design can induce two-phase flow and do so safely. Prototype testing will require design and fabrication of a prototype test train and a loop tube housing compatible with the test train height. Furthermore, it will entail design and procurement of heater rods with an associated power supply system. The currently existing flowing autoclave will be modified with a new pressure relief valve to accommodate test parameters.
- Design & Analysis: The IL-BWR project will include design and analysis of an in-pile tiered test train compatible with an ATR medium I-position. The test train assembly will include a nose piece in the lowest section, 3-fueled sections housing 4 fuel pins each in a 2x2 array, an upper tube to recombine the coolant, and 3 hanger rod sections. Design & Analysis will be performed using relevant software for which the INL currently own licenses run on the INL High Performance Computing (HPC) system.
- Fabrication & Assembly: In addition to fabrication associated with prototype testing, an experiment test train and canal tooling will be fabricated by INL at the North Holmes Laboratory (NHL) using existing equipment. The test train components include 3 hanger rods, 7 u-joints, a flow restrictor nose piece, a recombination tube, and 3 fuel holder tiers. Furthermore, 12 experiment fuel pins will be fabricated at the Materials & Fuels Complex (MFC), likely in the Advanced Fuels Facility (AFF). It is anticipated that 1 to 4 fuel centerline thermocouples will be developed by the INL and attached to the uppermost fuel pins. Assembly of the experiment will be performed at the Test Train Assembly Facility (TTAF). No special or new equipment is anticipated to be needed to perform fabrication and assembly of this experiment.
- Irradiation/Shipping: The experiment will undergo irradiation in the ATR for up to 8 cycles. A single fuel pin may be removed from the reactor after cycle 7 and shipped to MFC for PIE. However, the remaining 11 fuel pins will be removed from the test train in the ATR canal following irradiation and shipped to MFC for PIE. The fuel pins will be shipped to MFC using the GE-100 cask, or equivalent, and received at HFEF. The excess experiment components (hanger rods, u-joints, fuel housings) will be stored in the ATR canal to either be reused if possible or disposed of properly. ATR canal tooling will be designed and fabricated to support experiment reconfiguration and disassembly. This tooling will be reused for other similar designs and future I-Loop experiments.
- Post-Irradiation Examination: After receipt of the experiment at HFEF, the fuel pins will undergo the following PIE activities to assess cladding performance: mechanical testing, burnup analysis, fission gas puncture testing, and sectioning/metallography.
    - HFEF – cask receipt, sample preparation, microhardness testing, and metallography (oxide thickness, fuel-cladding interaction, hydride distribution.
    - Irradiated Materials Characterization Laboratory (IMCL) – electron probe microanalyzer (EPMA) for burnup analyses
    - Fuels and Applied Science Building (FASB) or Analytical Laboratory (AL) – Laser flash analysis (LFA) to measure thermal conductivity and diffusivity

The process typically involves the following activities:

- Generating experiment hardware design drawings
- Defining experiment Functional and Operational Requirements (F&OR) to meet ATR safety basis and ATF Program objectives
- Conducting experiment design review and obtaining ATR design acceptance

- Fabricating test train assemblies to house experiments in the ATR during irradiation
- Performing neutronic analyses of the aggregate fueled test trains (this activity includes providing enrichment specifications to fuel fabricators)
- Performing thermal-hydraulic analyses of the experiment assembly
- Performing structural analyses of the test train assembly
- Receiving test specimens (i.e., fuel pins) from development teams
- Fabricating test trains and experiment hardware
- Encapsulating specimens in the test trains
- Preparing the Experiment Safety Assurance Package (ESAP) and obtaining its approval from the Safety Operations Review Board (SORC), which authorizes irradiating experimental capsules in the ATR
- Inserting the experiment assembly into the ATR and irradiating the test trains to their specified burnup levels
- Storing discharged experiments (as necessary) in the ATR canal for cooling
- Shipping the discharged test train to the Hot Fuel Examination Facility (HFEF) at the Materials & Fuels Complex (MFC)
- Performing PIE at HFEF and supporting laboratories at MFC and coordinating the shipment of selected samples to other examination facilities as appropriate, contingent on the availability of an acceptable shipping cask/container

Waste generated during this work can be seen under the Environmental Aspects and Impacts.

Equipment purchased during this phase of work include: heater rods with associated power supply system and pressure relief valve.

The equipment after this project will be used at IEDF for future testing. These items will not be used in radiological facilities.

Revision 1

The purpose of this revision is to capture additional detail regarding the standard beryllium placed in the I-Loop to moderate neutron flux. The Advanced Test Reactor (ATR) I-Loop Booster Fuel Basket will hold an ATR Mark-VII fuel element. The basket will be made from 6061-T6 Aluminum and lined with S-65 beryllium where the fueled section of the element will rest. The beryllium liner is made of three pieces. Each piece is a cylinder about 16.5 inch long with a diameter of 4.75 inches and has a cut-out profile of a fuel element running through the center. They weigh about 9 lbs. each. Idaho National Laboratory (INL) designed the I-Loop Booster Fuel Baskets so no cutting or welding will be performed near the Beryllium. The baskets have a life span of about 20 years, after which the beryllium will be dispositioned as low-level Waste (LLW).

Original ECP

The safe, reliable, and economic operation of the nation's nuclear power reactor fleet has always been a top priority for the U.S. nuclear industry. Continual technology improvement, including advanced materials and nuclear fuels, remains central to the industry's success. The U.S. Department of Energy (DOE) aims to develop nuclear fuels and claddings with enhanced accident tolerance for use in the current fleet of commercial light water reactors (LWRs) and in advanced reactor concepts. Accident tolerant fuels (ATFs) are defined as fuel systems that, when compared to existing Zircaloy (zry) clad UO2 designs, can tolerate loss of active cooling while maintaining or improving the fuel performance during normal operations, operational transients, design-basis events, and beyond design-basis events. An extensive series of experiments and irradiations have been planned and performed under the ATF Program with the goal of inserting a lead fuel rod or assembly into a commercial power plant by 2022. Idaho National Laboratory (INL) supports research and development (R&D) efforts for the ATF Program by furnishing supplying fuel testing infrastructure, testing ATF concepts, and supporting collaborative efforts among industry, university, and other partners.

To achieve high-performance similar to modern LWR fuels, ATF materials require highly prototypic testing environments coupled with state-of-the-art and advanced diagnostics and modeling and simulation tools. This includes testing environments with pressurized water loops that simulate reactor coolant designs, including specific thermodynamic and chemistry conditions. Pressurized water loops have provided the primary capabilities for highly prototypic LWR fuel testing for the past decade, and domestic LWR loops for ATF Program fuel testing are needed. The only domestically-available prototypic water environment testing facilities are the Advanced Test Reactor (ATR) at INL and the Massachusetts Institute of Technology Reactor (MITR). The MITR has operational LWR loop facilities already being used by ATF vendors, but access is limited for prototypic fuel rod experiments. The ATR is currently the only facility (outside of Russia) that holds an in-pile pressurized water loops for integral irradiation testing of fuel rods for civilian programs. In addition, the ATR is collocated with the Transient Reactor Test (TREAT) Facility at INL, and a suite of post-irradiation examination (PIE) capabilities, to support related ATF Program test activities.

The ATF Program is currently developing experiments for the TREAT Facility and the ATR at INL. The purpose of the proposed action is to supply needed irradiation capabilities in pressurized water loops to support ATF Program needs and objectives. Specifically, the proposed action would reconfigure existing experiment space in the ATR by providing standardized instrumented test trains in existing “I-positions” to perform operational transient testing on integral fresh and previously-irradiated fuel rods. These are referred to as “I-Loops.” Along with ATR Loop 2A, a minimum of two additional I-Loops will provide options for (1) power ramp testing and (2) testing in Boiling Water Reactor (BWR) conditions.

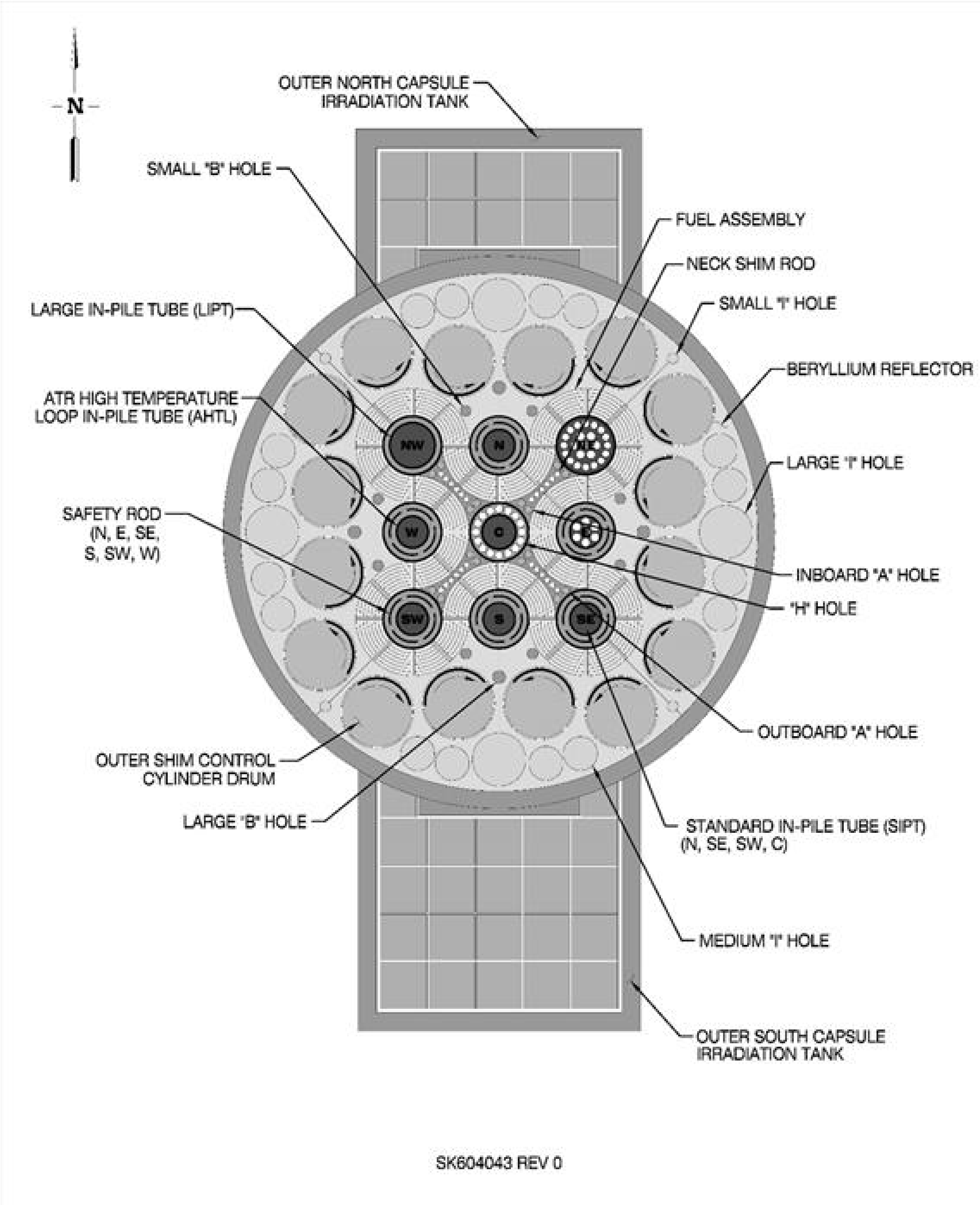
These capabilities are proposed to be installed during the ATR core internals changeout (CIC) in 2021. As discussed in more detail below, the ATR reconfiguration includes replacing the reactor pressure vessel top head closure plate to include additional equipment penetrations and modifying the I-positions by installing equipment to operate the I-Loops).

The ATR has been operating continuously since 1967 and is used for a wide variety of government- and privately-sponsored research. In 2007, DOE designated the ATR and INL's PIE capabilities as a Nuclear Science User Facility (NSUF), emphasizing the reactor's role in supporting research led by universities in collaboration with other laboratories and industry. The available ATR experimental space is shared by DOE, industry partners, other nations, NSUF members, and the US Navy.

The ATR is designed for irradiating experiments, and many different experiment programs have been and can be conducted at the facility. The reactor includes an array of core and capsule irradiation tank locations specifically designed to accommodate a variety of experiment assemblies including (1) pressurized water loop in-pile tube (IPT) experiment assemblies, (2) drop-in capsule irradiation assemblies, and (3) instrumented lead capsule assemblies. The first experiment type is positioned in an IPT that isolates the experiment from the reactor coolant and provides a way to control the experiment environment in terms of pressure, temperature, coolant flow, and chemistry. The second is a drop-in capsule fixed in a core or a capsule irradiation tank position and cooled by reactor primary coolant. The third type is a lead capsule experiment fixed in a core or a capsule irradiation tank position with instrumentation lines that exit the experiment and the reactor vessel and are connected to a control system for monitoring and controlling operating parameters. Specific experiment locations within the core change as needed to meet different program needs.

The ATR supplies a high neutron flux (up to 1 × 1015 n/cm2/sec thermal) environment for flux traps that may contain in-pile tubes for high-pressure loops or other flux trap irradiation facilities, and, as noted, already supports ATF efforts and experiments. ATR is a light-water-cooled and moderated reactor with a design thermal power of 250 megawatts (MW). The reactor vessel is entirely stainless steel and the core internals are replaced every 7 to 9 years. ATR currently operates at about 150 MW or less. Typical operating cycles are two to eight weeks at power followed by a 7-day outage for refueling and changeout of experiments and isotope production targets. The core is 1.2 meters (4 feet) high and is surrounded by a 1.3-meter-diameter (4.25-foot-diameter) beryllium reflector.

Figure 1 shows the ATR core configuration with pressurized water loop facilities located in six of the flux traps, and non-loop irradiation facilities in the remaining three flux traps. This configuration of the reactor reflects the 1994 CIC and the 2012 standard in-pile tube (SIPT) installation in the center flux trap. Historically, the core has undergone several reconfigurations supporting irradiation programs. For example, in 1997 the capsule irradiation facility in the northeast flux trap was replaced by the Irradiation Capsule Experiment (ICE) facility. The core was reconfigured in 1999 with the installation of the Irradiation Test Vehicle (ITV) in the center flux trap, and the Multiple Irradiation Capsule Experiment (MICE) facility replaced ICE in the northeast. In 2004 the ITV was removed, and in 2011 the MICE was removed. Last, in 2012 the Advanced Gas Reactor 3/4 was installed in the northeast, and the center irradiation facility was replaced with the 2A C SIPT. The proposed action represents an additional reconfiguration to support testing needs.



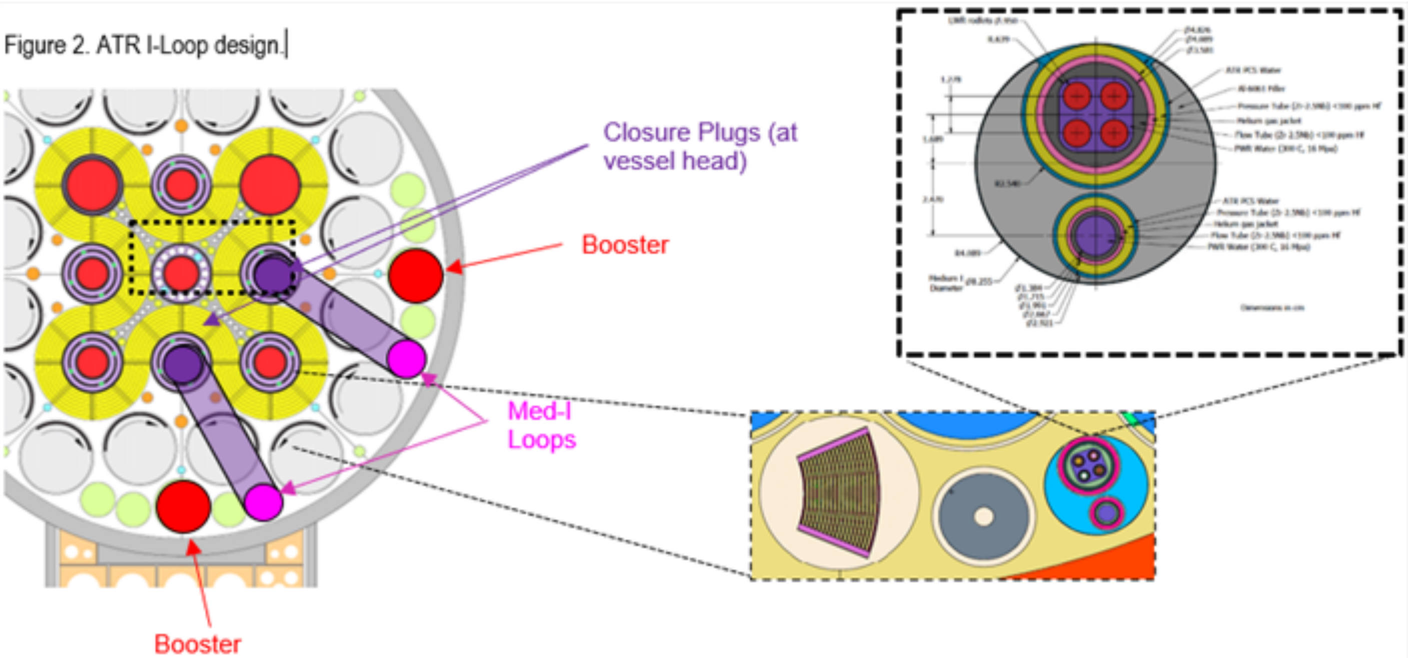
The I-positions included have been a part of ATR since it first went critical. Typically, loops have been placed in flux traps to take advantage of the high flux in those areas. The I-positions have a lower flux than the flux traps and other irradiation positions closer to the center of the core and have been used less frequently. Nevertheless, they have been used many times, and recently, researchers developing new power reactor fuels have desired lower fluxes that are more typical of Pressurized Water Reactors and BWRs. Past lead-out experiments conducted in the I-positions include Tritium Producing Burnable Absorber Rod (TPBAR) Materials Irradiation Separate Effects Test (TMIST) experiment 3A and 3B, and University of California Santa Barbara (UCSB) experiment 2. Past fueled and material drop-in experiments conducted in the I-positions include the ATF-1 experiments, Boise State University research, and the U.S. High Performance Research Reactor Mini Plate Experiment. The Flux Enhanced Large I (FELI) experiment was a fuel element designed specifically for the large I-positions.

Monte Carlo investigations demonstrate that the proposed inclusion of a standard ATR driver fuel assembly in a large-I position can increase neutron population in the outer reflector while placing a standard beryllium plug between this “booster fuel” and the I-Loop moderates the spectrum for a 10-15% thermal neutron flux increase in the fuel specimen. This approach can elevate thermal neutron flux to that needed for the

ATF Program during routine ATR cycles. This flux level also scales with adjacent lobe powers; enabling it to be at least doubled during high-power cycles. These high-power cycles typically last ~10 days and occur roughly once or twice per year at 50-60 MW lobe power.

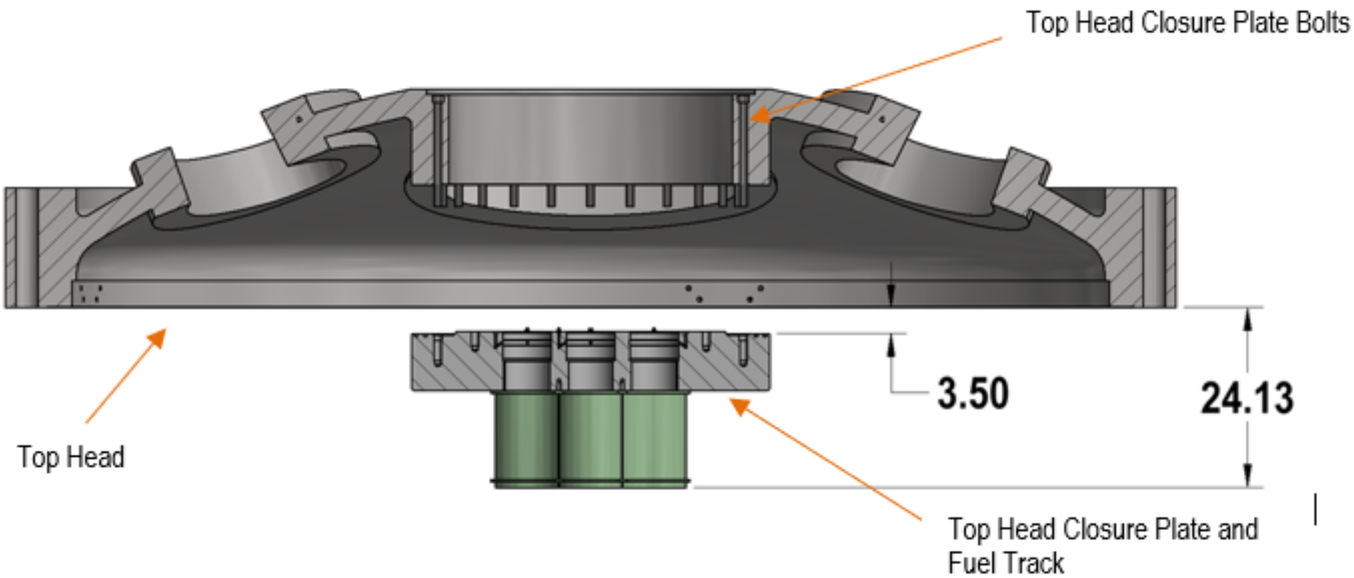
Typical flux trap-based loops have annular return flow paths in the core and are composed primarily of stainless steel IPTs, and yet still often require flux shrouds in test train hardware (e.g. hafnium) to reduce flux to achieve LWR prototypic heating rates. For I-positions the objective is different and requires greater neutron economy. A non-annular loop layout with the test section oriented toward the core and using nuclear grade Zr-2.5Nb alloy (which has been used extensively in high fluence pressurized water conditions in CANDU reactors) work to accomplish this aim in the proposed I-Loop design (see Figure 2). Thermal neutron flux in medium-I positions are slightly higher than the large-I positions during typical ~50 day ATR power cycles, which makes the medium-I positions the preferred location for I-Loops. Each I-Loop enables a 2×2 rodlet array (giving up to 16 total 30 cm rodlets across the ATR active core length per loop). The proposed I-Loop design shown in Figure 2 is also compatible with other test train configurations such as a cross section with two or three individual rodlets in discrete flow tubes for varying thermal hydraulic conditions within a single test assembly, or a single rodlet cross section to reduce rod-to-rod self-shielding for increased nuclear heating with additional volume for instrumentation.

Figure 2. ATR I-Loop design.



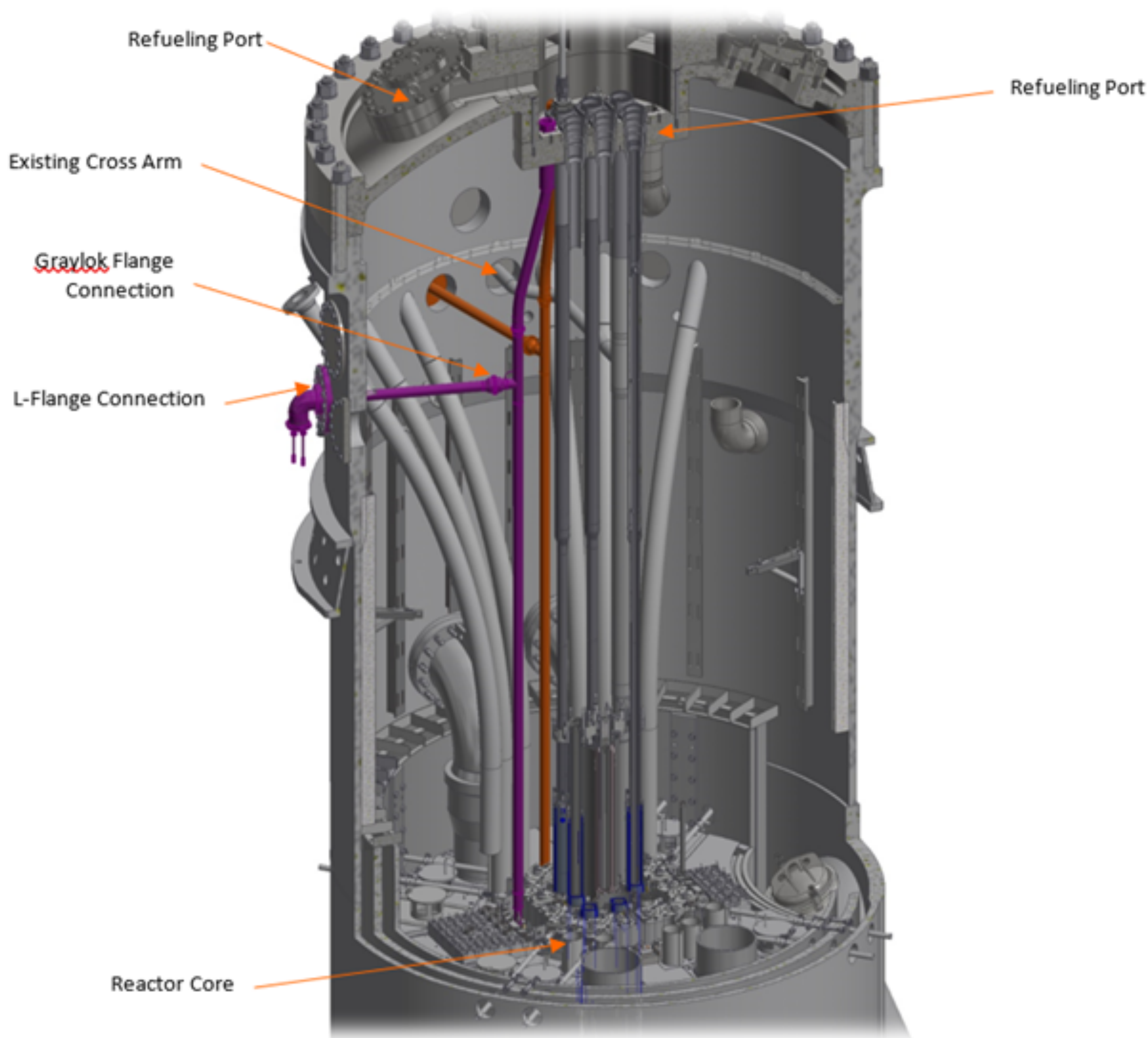
Existing penetrations through the pressure vessel top head closure plate and shielding structures for high-pressure plumbing and test train extraction via overhead casks reflect the ATR design being based around the nine flux traps. To facilitate irradiation testing using the proposed I-Loop configuration, INL proposes to replace the reactor pressure vessel top head closure plate with a new plate containing eight additional new peripheral penetrations. This closure plate is a relatively small part of the pressure vessel head (four feet in diameter) as shown in Figure 3 and is planned to be replaced during the 2021 CIC. Completing the retrofit during CIC reduces the risk of interrupting other planned operations. Structural calculations show the new penetrations will not compromise the reactor pressure boundary.

Figure 3. Existing ATR top head



In addition, the proposed action installs new IPTs so that test train extraction and instrument leads route through the top head closure plate and permanent plumbing penetrates through existing flanges through the side of the reactor pressure vessel in the manner typical for lead-out experiments. The slight offset of these IPTs requires test trains designed to facilitate insertion and extraction (see Figure 4). Test train extraction in this fashion facilitates transporting the irradiation tests to ATR's storage pool, the adjacent dry transfer cubicle hot cell, or to hot-cells for a variety of post-irradiation examinations.

Figure 4. I-Loop in-pile tubes in the ATR.



INL also anticipates removing several experiments and support equipment currently in the ATR during the CIC (e.g. Advanced Gas Reactor test support equipment). Removing and repurposing this equipment enables I-Loop hydraulic support equipment (e.g. pressurizers, line heaters, pumps, heat exchangers, ion exchangers, and coolant chemical conditioning) to be installed in shielded cubicles for connection to the I-Loop IPTs. I-Loop hydraulic support equipment will be designed, constructed, and installed in accordance with equivalent specifications, and in many cases identical equipment, as the presently installed flux trap-based pressurized water loops. While the new top head closure plate will be radially symmetric, creating penetration ports for up to eight lead-out and loop types experiments, the current plan utilizes two I-Loops in order to allocate test capabilities adequate for the ATF Program and the ability to control two coolant conditions for various tests. Preliminary design and safety evaluations have been performed and show that this effort is a viable strategy to address the need for LWR fuel irradiation testing capabilities for the ATF Program.

The proposed action would not compromise the existing structural or architectural capabilities with respect to the original ATR design criteria. Applicable DOE orders and ATR technical specifications would be used to establish construction criteria for materials, design and safety analyses, fabrication examination, and testing. System instrumentation would be designed to provide measurements and controls necessary for public and personnel safety.

The proposed action does not change the function or design capacity of the ATR, nor does it extend the life of the ATR. All experiment locations currently exist in the ATR, and there will be no additional positions added. ATR's current safety basis (SAR-153) discusses the configurable nature of loop experiments and supports the conclusion that these I-Loops will not increase ATR's total loop inventory beyond the facility's original basis. All experiments conducted in these loops will undergo the established experiment safety analysis process to verify compliance with the current safety envelope.

Experiments and testing activities anticipated to be conducted in the I-Loops include operational limits testing, secondary degradation testing, ramp testing, and in-pile instrumentation testing. These types of tests have been and will continue to be performed using ATR's flux trap-based pressurized water loops.

The ATF Program encompasses a wide range of Technical Readiness Levels (TRL) and, therefore, also a broad range of associated timelines for R&D needs. When considering potential testing activities to be performed in the I-Loops, specific data streams, experiment and data objectives, strategies, and processes are difficult to predict. Specimen quantities (total experimental capacities) for ATF are an important consideration that also cannot be fully predicted. This analysis does not provide detailed specifications for all experimental programs needed by all ATF developers. Rather, the scope of this analysis is to supply the primary testing capabilities to meet the need for in-pile pressurized water loops for integral irradiation testing required by the ATF program. The environmental impacts of other experimental programs needed by ATF developers will be evaluated in separate analyses in compliance with the National Environmental Policy Act (NEPA).

INL leads the planning, design, and analyses of irradiation experiments in coordination with the various institutions that are engaged in developing the ATF concepts. The INL performs irradiation experiments in the ATR and coordinates the PIE on the discharged materials. The discharged materials are shipped from the ATR to the Hot Fuels Examination Facility (HFEF) and/or the TREAT Facility at the Materials and Fuels Complex (MFC). The process typically involves the following activities:

- Generating experiment hardware design drawings
- Defining experiment Technical and Functional Requirements (T&FR) to meet ATR safety basis and ATF Program objectives
- Conducting experiment design review and obtaining ATR design acceptance
- Fabricating basket assemblies to house experiments in the ATR during irradiation
- Performing neutronic analyses of the aggregate capsules (this activity includes providing enrichment specifications to ATF fabricators)
- Performing thermal-hydraulic analyses of the experiment assembly
- Performing structural analyses of the capsules acting as ASME-standard pressure vessels and ATF test rodlets
- Receiving test articles (i.e., ATF test rodlets) from development teams
- Fabricating capsules
- Encapsulating test materials in the capsules
- Preparing the Experiment Safety Assurance Package (ESAP) and obtaining its approval from the Safety Operations Review Board (SORC), which authorizes irradiating experimental capsules in the ATR
- Shipping the finished capsules to the ATR
- Receiving the capsules at ATR and loading the basket assembly
- Inserting the basket assemblies into the ATR and irradiating the capsules to their specified burnup levels
- Handling experiment and basket change-outs during ATR outages as needed
- Storing discharged experiments (as necessary) in the ATR canal for cooling
- Shipping the discharged capsules to HFEF at MFC
- Performing PIE at HFEF and supporting laboratories at MFC and coordinating the shipment of selected samples to other examination facilities as appropriate, contingent on the availability of an acceptable shipping cask/container.

After PIE, irradiated test pin segments and PIE remnants are 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/EIS-0203, 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, the ATF Program uses the HFEF hot cell which contains both defense and nondefense related materials and contamination. Project materials 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). 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 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

Packaging, repackaging, transportation, receiving, and storing used nuclear fuel and R&D for used nuclear fuel management is covered by DOE's Programmatic Spent Nuclear Fuel (SNF) Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement (EIS) 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 (February 1996). The analyses include those impacts related to transportation to, storage of, and research and development related to used nuclear fuel at the INL (see Table 3.1 of the SNF Record of Decision (May 30, 1995) and Table 1.1 of the Amended Record of Decision [February 1996].

The environmental impacts of transferring low level waste from the INL to the Nevada National Security Site were analyzed in the 1996 Nevada Teste Site EIS (DOE/EIS-0243) and suppleantal analysis (SA) (DOE/EIS-0243-SA-01) and DOE's Waste Management Programmatic EIS (DOE/EIS-200). The fourth ROD (65 FR 10061, February 25, 2000) for DOE's Waste Management Programmatic EIS established the Nevada National Security Site as one of the two regional low-level waste (LLW) and mixed low level waste (MLLW) disposal sites. The SA considers additional waste streams, beyond those considered in the 1996 NTS EIS, that may be generated at or sent to the Nevada National Security Site for management.

The potential for transportation accidents was analyzed in the SNF EIS (Section 5.1.5 and Appendix I-5 through I-10) and in the FRR EIS (Sections 4.2.1 and 4.2.2.).

In addition to disposal of the irradiated material generated as described above, industrial, mixed, and low-level waste may be generated throughout the R&D process. This waste will be classified and disposed in accordance with INL procedures and DOE regulations/requirements.

SECTION C. Environmental Aspects or Potential Sources of Impact:

Air Emissions

NA

Discharging to Surface-, Storm-, or Ground Water

Storing discharged experiments (as necessary) in the ATR canal for cooling

Disturbing Cultural or Biological Resources

Storing discharged experiments (as necessary) in the ATR canal for cooling

Cultural: Pursuant to the 2023 Programmatic Agreement, this federal undertaking is excluded from Section 106 review and the proposed activity results in no historic properties affected.

Generating and Managing Waste

i. Industrial – no
ii. Hazardous – no
iii. PPE, wipes – nominal (a few wipes for disassembling experiment and loading cask in ATR canal)
iv. Radioactive – yes, see below
v. Low level < 5kg (experiment hardware)
vi. Mixed – no
vii. TRU < 1m3 produced through ATR irradiation and in PIE facilities at MFC (reference INL-19-121 R1)

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

NA

Environmental Justice

According to the CEQ Climate and Economic Justice Screening Tool, the INL site as well as the Research and Education Campus in Idaho Falls, ID are located in U.S. Census tracts that are identified as disadvantaged communities. Census tracts identified as disadvantaged meet or exceed socioeconomic, environmental, health, or demographic thresholds identified by CEQ. Given that activities analyzed in this document will happen within the boundaries of existing DOE/INL land and/or facilities where there are no permanent residents, any impacts to Environmental Justice in surrounding communities are anticipated to be negligible.

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). In addition, no extraordinary circumstances related to the proposal exist that would affect the significance of the action. In addition, the action is not "connected" to other action actions (40 CFR 1508.25(a)(1) and is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1608.27(b)(7)).

References: B1.31 "Installation or relocation of machinery and equipment", B3.6 "Small-scale research and development, laboratory operations, and pilot projects"
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- Record of Decision (1996) 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 for the Multipurpose Haul Road Within the Idaho National Laboratory Site (DOE/EA-1772, 2010)

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)

Final Environmental Assessment(EA) and Finding of No Significant Impact(FONSI)f or the Resumption of Transient Testing of Nuclear Fuels and Materials (DOE/EA-1954, February 2014).

Justification: B1.31 Installation or relocation and operation of machinery and equipment (including, but not limited to, laboratory equipment, electronic hardware, manufacturing machinery, maintenance equipment, and health and safety equipment), provided that uses of the installed or relocated items are consistent with the general missions of the receiving structure. Covered actions include modifications to an existing building, within or contiguous to a previously disturbed or developed area, that are necessary for equipment installation and relocation. Such modifications would not appreciably increase the footprint or height of the existing building or have the potential to cause significant changes to the type and magnitude of environmental impacts.

B3.6 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.

Transportation, receiving, and storing used nuclear fuel, as well as, research and development for used nuclear fuel management is covered by DOE's Programmatic Spent Nuclear Fuel (SNF) 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 (February 1996). The analysis includes those impacts related to transportation to, storage of, and research and development related to used nuclear fuel at the INL (see Tables 3.1 of the SNF Record of Decision (May 30, 1995) and Table 1.1 of the Amended Record of Decision [February 1996]. The EIS limits the number of shipments to the INL, and the proposed activities would fall within the limits of the EIS.

The potential for transportation accidents has already been analyzed in the SNF EIS (Section 5.1.5 and Appendix through 1-10). NEPA coverage for the I-5 transportation and disposal of waste to WIPP are found in Final Waste Management Programmatic Environmental Impact Statement[WM PEIS](DOE/E1S- 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 TRU waste at the generator-storage facilities would be conducted. The Department has analyzed TRU waste management activities in the Final Waste Management Programmatic Environmental Impact Statement(WM PEIS) (DOE /E1S-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.

The environmental impacts of transferring low level waste from the INL to the Nevada National Security Site were analyzed in the 1996 Nevada Test

Site EIS (DOE/EIS-0243) and supplemental analysis (SA)(DOE/EIS-0243-SA-01) and DOE's Waste Management Programmatic EIS (DOE/EIS-200). The fourth Record of Decision (ROD)(65 FR 10061, February 25, 2000) for DOE's Waste Management Programmatic EIS established the Nevada National Security Site as one of two regional LLW and MLLW disposal sites. The SA considers additional waste streams, beyond those considered in the 1996 NTS EIS, that may be generated at or sent to the Nevada National Security Site for management.

The impacts of transporting spent fuel, special nuclear materials, and research fuels between MFC and other INL Site facilities using the Multi-Purpose Haul Road were analyzed Final Environmental Assessment for the Multipurpose Haul Road Within the Idaho National Laboratory Site (DOE/EA-1772).

Onsite disposal of RH-LLW was analyzed in the Final Environmental Assessment 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, 2011).

DOE evaluated the environmental impacts of transient irradiations in the TREAT reactor, including 1) transporting experiment materials between MFC and TREAT, 2) pre- and post-irradiation radiography, 3) PIE of test components at HFEF or other MFC facilities, and 4) waste generation and disposal in the Environmental Assessment(EA) and Finding of No Significant Impact (FONSI)f or the Resumption of Transient Testing of Nuclear Fuels and Materials (DOE/EA-1954, February 2014).

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