Issued on January 16, 2018

DOE-ID Operations Summary
For the Period July 1, 2017- September 30, 2017

EDITOR'S NOTE: *The following is a summary of contractor operations at the Idaho National Laboratory Site, managed by the DOE- Idaho Operations Office. It has been compiled in response to a request from stakeholders for more information on health, safety and environmental incidents at DOE facilities in Idaho. It also includes a brief summary of accomplishments at the Site. POC: Danielle Miller, (208) 526-5709.*

Idaho Cleanup Project (ICP)

July 11: An Information Technology Technician at the Advanced Mixed Waste Treatment Project performed work on an air conditioning unit without proper work controls in place. [EM-ID--FID-RWMC-2017-0002]

August 16: An electrician working at the Accelerated Retrieval Project performed electrical work without wearing the proper personnel protective equipment. [EM-ID--FID-RWMC-2017-0003]

August 31: During an assessment of the Idaho Cleanup Project's lockout/tagout (LO/TO) program at the Idaho Nuclear Technology and Engineering Center, an assessor discovered that an ICP worker had signed in on the LO/TO record sheet to accept a LO/TO number for his work group, but did not have the required qualification to do so.
[EM-ID--FID-LANDLORD-2017-0004]

September 13: Fluor Idaho LLC, managing contractor for the Idaho Cleanup Project, declared a Management Concern due to a number of recent work control violations and safety incidents, which has created a negative performance trend in executing work in a safe and compliant manner. As a result, Fluor Idaho placed on hold, all maintenance, operations and construction work activities, with the exception of vital operations, specifically those required by an environmental permit, by regulatory compliance, or by a safety basis. Following the hold, Fluor Idaho, issued an Executive Management Directive to outline the actions necessary to release work; Fluor Idaho will deliberately release fieldwork following the criteria outlined in the aforementioned management directive. [EM-ID--FID-INLPROGM-2017-0005]

September 25: Workers at the Advanced Mixed Waste Treatment Project did not perform an independent verification for a manual barcode number entry into a non-destructive assay system. The barcode number entered into the system was incorrect causing an invalid data display following assay completion, which resulted in a noncompliance with a nuclear criticality control. [EM-ID--FID-AMWTF-2017-0005]

Notable Accomplishments: **Scaled Model of IWTU Performs Successfully in 30-Day Demonstration:** A scaled model of the Integrated Waste Treatment Unit (IWTU) performed exceptionally well during a recent month-long demonstration, continuing EM and cleanup contractor Fluor Idaho's progress in confirmatory testing and preparations to start up the facility.

Engineers frequently adjusted the operating parameters of the pilot plant at the Hazen Research facility in Colorado, including the simulant feed rate, temperature, and product particle size to assess the process under varying conditions. Despite the intentional changes, the pilot plant produced the desired dried granular waste product. It treated the same simulant waste used in prior demonstrations at the IWTU.

"We operated over a wide range of operating conditions to assess performance and the pilot plant handled all conditions as designed," said IWTU Technical Issues Resolution Project Manager Leo Thompson. "This testing confirms that the process of converting simulated waste into a carbonate form works over a wide range of conditions. We learned a tremendous amount about the behavior of the process at different conditions, which we can apply to the IWTU for its next demonstration run."

Thompson said the pilot plant continued to produce wall-scale on the interior of its reaction vessel, just like the IWTU did in its six demonstrations. But the varying conditions revealed trends that help the team understand the formation mechanisms. Under some conditions, minimal scale formed. The scale, resembling bark, has the potential to produce fluidization challenges in the IWTU, but the Hazen testing is giving engineers a better understanding why it forms, if and how it can be minimized, and its effect on the waste treatment process.

"We have a better idea of the factors that control wall-scale formation," said Thompson. "Importantly, the wall-scale had no effect on the fluidization inside the Hazen reaction vessel."

The IWTU will use a fluidized bed steam-reforming process to treat the remaining 900,000 gallons of liquid radioactive waste from the Idaho Site's underground tank farm. The facility's primary reaction vessel, the Denitration Mineralization Reformer (DMR), contains billions of tiny beads kept in a fluidized state with the help of superheated gases. Liquid waste enters the fluidized bed, coating the beads like the formation of pearls. The waste product is transferred to stainless steel canisters and ultimately concrete vaults.

Engineers are modifying IWTU. They completed work to install a new ring header with an improved design in the DMR using an 18-inch manway. The ring header injects gases and steam into the reaction vessel to fluidize the beads that form during waste treatment. The ring was damaged in a prior demonstration. The engineers are developing the improved design using computer simulations, pilot testing, and input from industry experts.

Engineers will reconfigure the bottom of the DMR to a conical shape to prevent a prior problem from repeating: the creation of "sand castles" that greatly affect the fluidization of the waste product during demonstrations. The DMR's present shape results in the creation of "dead zones," which allow treated product to settle and accumulate at the vessel's bottom. The new design will be tested in the pilot plant and installed in the IWTU this fall, with another demonstration to follow.

Idaho National Laboratory (INL)

July 11: Zero energy checks performed on an isolated locked out/ tagged out steam and condensate system for the boiler in the Experimental Breeder Reactor II building were determined to be suspect because there was no energy present to support validation of isolation thru a proper zero energy check. [NE-ID--BEA-FCF-2017-0002]

July 14: Advanced Test Reactor maintenance electricians discovered the presence of energized conductors in a junction box thought to be de-energized. The junction box housed conductors for the 2-ton crane, which was being dismantled in preparation for replacement. At no time were personnel exposed to energized electrical components during work performed on the crane. [NE-ID--BEA-ATR-2017-0033]

July 20: A Quality Assurance inspector performed an inspection on a pressurizing pump at the Advanced Test Reactor without hanging a personal lock and tag as required by the work order. The energy source had been isolated and controlled and no worker exposure occurred. [NE-ID--BEA-ATR-2017-0034]

August 22: A startup procedure for the Advanced Test Reactor-C was exited prior to completion due to erratic indication on a neutron measurement instrument. The ATRC was shut down at the time the abnormal indications were observed. An actual unsafe condition did not exist. [NE-ID--BEA-ATR-2017-0037]

August 23: A relay in a primary coolant pump panel, at the Advanced Test Reactor was identified as failed. The ATR was in a maintenance outage and the core was defueled at the time of failure. [NE-ID--BEA-ATR-2017-0038]

August 24: A channel indication on a Log Count Rate Monitor at the Advanced Test Reactor had failed, rendering the instrument inoperable. The ATR was in a maintenance outage and the core was defueled at the time of failure. [NE-ID--BEA-ATR-2017-0039]

September 12: A lockout/tagout was performed at an in-town facility by a worker whose qualifications had expired. [NE-ID--BEA-STC-2017-0003]

September 14: A floor crane moving a handling tool at the Advanced Test Reactor made contact with an experiment storage rack. The storage rack was not being used for fissile material storage at the time of the event. [NE-ID--BEA-ATR-2017-0040]

September 20: A deep well pump at the Advanced Test Reactor tripped off due to an unknown power supply anomaly. At the time of discovery, ATR was shut down and defueled. [NE-ID--BEA-ATR-2017-0041]

September 26: A primary coolant pump motor starter failed to start at the Advanced Test Reactor. Primary coolant system startup was in progress at the time of the failure.
The ATR was shut down and no other PCPs were running at the time. [NE-ID--BEA-ATR-2017-0042]

September 26: Personnel at the Materials and Fuels Complex discovered that a lockout/tagout to prevent mechanical motion was performed by a unqualified subcontract employee. The noncompliance was discovered during review of the worker's qualifications. No personnel were exposed to hazardous energy sources. [NE-ID--BEA-MFC-2017-0007]

Notable Accomplishments: **Innovative fuel manufacturing process moves closer to market**

INL researchers are working with industry partners on an innovative method of producing advanced nuclear fuels that improve the attractiveness of new nuclear plants as reliable, emission-free baseload energy.

As part of a DOE accelerated technology commercialization project, INL's Dr. Isabella Van Rooyen and Dr. Clemente Parga worked with Westinghouse's Ed Lahoda to develop an innovative process for producing uranium silicide (U3Si2) fuel for advanced reactors.

Their process was dubbed AMAFT – short for Additive Manufacturing as an Alternative Fabrication Technique – for nuclear fuel.

Traditional fuel manufacturing methods require several steps to convert raw uranium ore into UF6, and then again into the UO2 that will be used in the final fuel for a light-water reactor.

Van Rooyen explained that the AMAFT process can reduce steps from the traditional fabrication method that requires preprocessing of UF6 to convert it to UO2. AMAFT can start with any uranium-based feedstock, which opens up the supply chain and eliminates the conversion steps. In addition, the team is working to make AMAFT easy to scale – which is another big requirement for commercial viability.

This hybrid process, in combination with other advanced manufacturing processes, provides much greater flexibility for fabricators, including the capability to use multiple raw material sources.

Van Rooyen and Parga were joined by University of Florida Ph.D. candidate Jhonathan Rosales, who performed various characterization activities on the development products. Another set of benchtop experiments is underway on surrogate material utilizing a benchtop pulsed laser supported by INL researchers David Swank and DC Haggard.

In addition to the technical development of the novel AMAFT fabrication process, the team has accelerated the commercialization process by participating in DOE’s Energy I-Corps initiative, a

program intended to foster a more entrepreneurial mindset among researchers at DOE laboratories.

The Energy I-Corps program pairs DOE researchers with industry mentors as they work to refine their concept to support potential customers' specific needs. The AMAFT Energy I-Corps team consisted of Isabella van Rooyen (principal investigator), Dr. George Griffith (entrepreneurial lead) and Ed Lahoda (industry mentor).

"It was a surprise to learn how critical partnerships would be to the overall commercialization process. We need partners to help with qualification, standards, process development and characterization," Van Rooyen said. "Energy I-Corps was an opportunity to think outside the box from our normal everyday research mindset."

The team's participation in the Energy I-Corps program not only helped accelerated the AMAFT concept's commercial readiness, but the 75 industry interviews have been helpful in the development of INL's rapidly growing advanced manufacturing strategy.