FY2018
1st Quarter
INL/EXT-18-44410

Idaho National Laboratory

Quarterly Occurrence Analysis

Deeper Learning Through Event Analysis

Contents

INL/EXT-18-44410 – *1st Quarter FY-18*

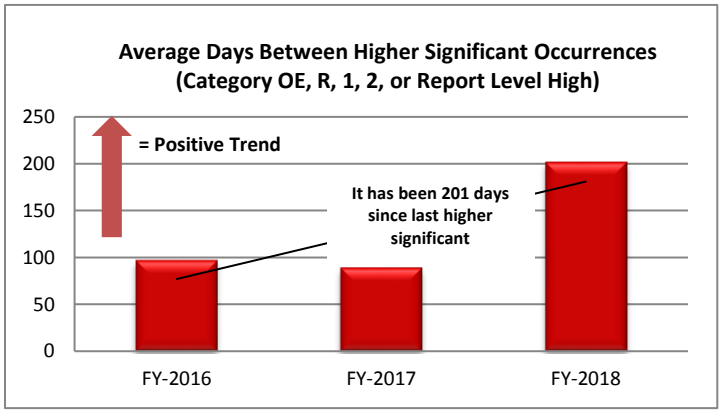
This report is published quarterly by the Idaho National Laboratory (INL) Nuclear Safety, Quality, and Performance Management Organization. This report is the analysis of 84 reportable events (19 from 1st quarter of fiscal year [FY]-2018 and 65 from the prior three reporting quarters), as well as 47 other issue reports identified at INL during the past 12 months (seven from this quarter and 40 from the prior three quarters.). These 47 other issues include events found to be not reportable in ORPS and issues or conditions screened as Category A or B conditions.

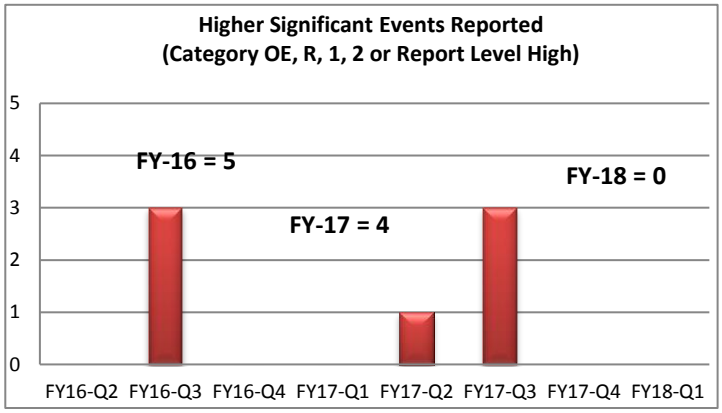
Battelle Energy Alliance (BEA) operates INL under contract DE-AC07-051D14517.

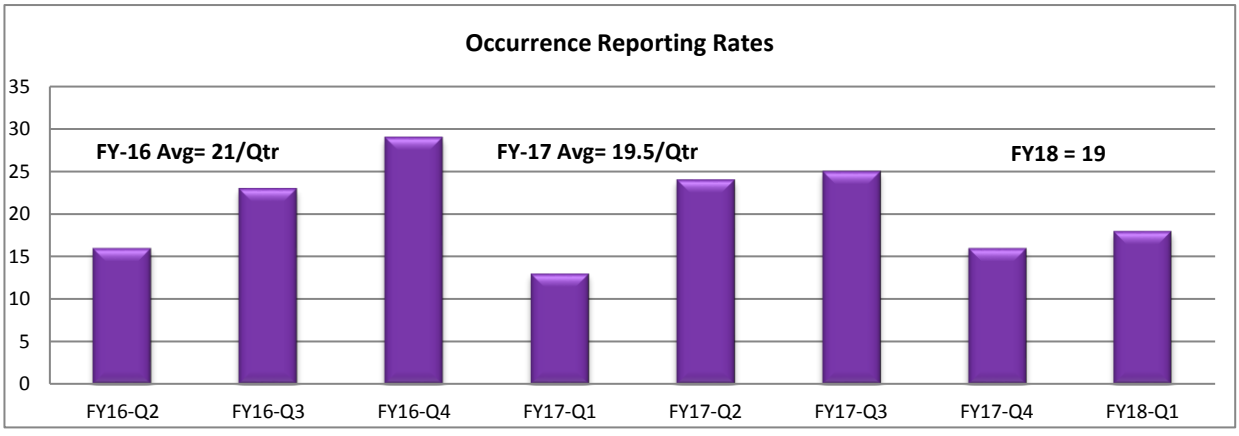
Highlights…

INL reported 19 events this quarter; the number of reported events has remained somewhat steady with an average of 21 events reported per quarter in FY-16, 19.5 per quarter FY-17, and 19 per quarter for FY-18. No higher significant events (those reported as Operational Emergencies, Recurring Issues, and/or Significance Categories 1 or 2, or a High Reporting Level) have been reported for the past two quarters. The average number of days between higher significant occurrences is trending in a positive direction. There have been 201 days since the last higher significant event occurred.

This quarterly analysis reviews reportable and non-reportable events and provides a summary of Lessons Learned issued by INL.







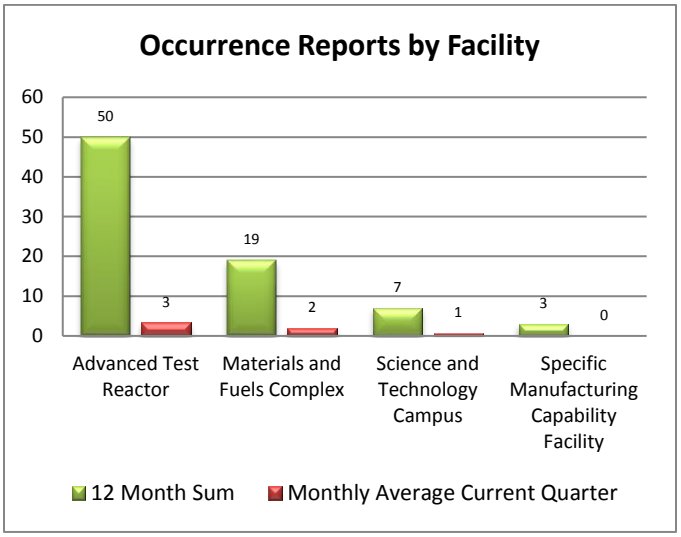
From October 1 through December 31, 2017, INL reported 19 new events to DOE in accordance with DOE Order 232.2 and the INL Tailoring Agreement. These events were analyzed to determine commonalities related to: Operational Emergencies (Group 1), Personnel Safety and Health (Group 2), Nuclear Safety Basis (Group 3), Facility Status (Group 4), Environmental (Group 5), Contamination and Radiation Control (Group 6), Nuclear Explosive Safety (Group 7), Packaging and Transportation (Group 8), Noncompliance Notifications (Group 9), and Management Concerns (Group 10).

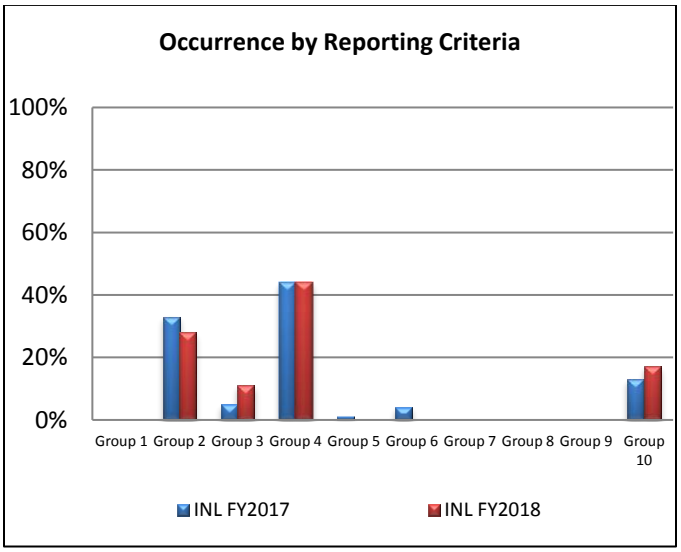
In addition, INL reported seven events through Initial Notification Reports and in INL's local issues tracking software (i.e., LabWay) that did not meet ORPS reporting thresholds.

TREND SNAPSHOT

Occurrences by Facility: During the reporting quarter, the Advanced Test Reactor (ATR) Complex reported 10 of the 19 events that occurred. Six of these were associated with performance degradations of safety-class (SC) or safety-significant (SS) systems, structures, and components (SSCs). The ATR Complex has reported 29 events under performance-degradation criteria in the last 12 months. ATR Complex management is aware of the conditions and is monitoring reactor systems via System Health reports. Additional action will be taken if deemed necessary. The Materials and Fuels Complex (MFC) reported six of the 19 events.

Reporting Criteria: INL continues to experience most events in Groups 2, 4, and 10. Over the last 12 months, the most common events in Group 2 were related to a failure to follow hazardous-energy control process. The most commonly occurring Group 4 events were related to performance dedregation of safety-class SSCs and the most common Group 10 events were related to near misses.



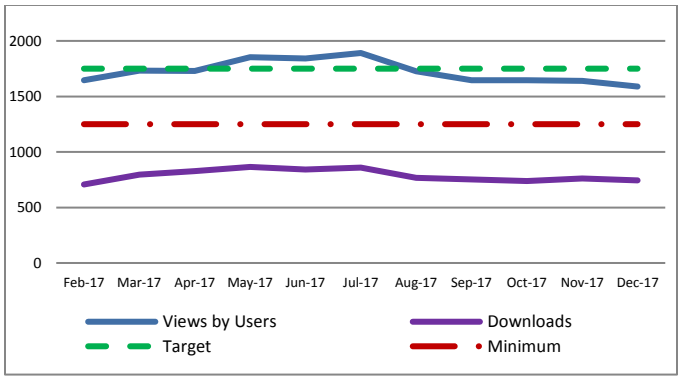


TREND SNAPSHOT

Lessons Learned: Although the total Lessons Learned content views for 1st Quarter FY-18 fell below the goal of 1750 views per month, use of the Lessons Learned Program still remains strong. INL published 15 new Lessons Learned, one General Information report, one Best Practice, one Success Story, and one Video into the OPEXShare system.

The INL Lessons Learned Program continues to be a key part of the feedback and improvement process required by DOE and used at INL. Operational excellence requires the use of internal and external operating-experience information to minimize the likelihood of undesirable behaviors and promote noteworthy practices. INL employs the OPEXShare platform (www.opexshare.doe.gov) to facilitate the sharing of information and operational experience.

Each opportunity to learn from both our own and other's events or successes is systematically evaluated and implemented to help continuously improve performance. INL embraces the philosophy that lessons learned are lessons applied. This is demonstrated through actions taken on other's lessons learned shared, such as those described in the success stories reported herein.



Lessons learned generated by INL are shared internally and, when necessary, across the complex through the DOE Headquarters Lessons Learned Program. During 1st Quarter FY-18, INL shared the following 15 Lessons, one General Information report, one Best Practice, one Success Story, and one Video.

- Lessons Learned INL-2017-0036, Rigging Sling Failure During Load Transfer
- Lessons Learned INL-2017-0037, LO/TO Danger Tag Falls Off Breaker—Procedure Use Less-than-Adequate
- Lessons Learned INL-2017-0038, Smoke From Laboratory Oven
- Lessons Learned INL-2017-0039, Leaking Rainwater Leads to Loss of Main Cell Pressure and Temperature Controls
- Lessons Learned INL-2017-0040, Portable Radio Battery Fire.
- Lessons Learned INL-2017-0041, Lock Out/Tag Out Violation by Quality Assurance Inspector
- Lessons Learned INL-2017-0042, Failure of New Lock Springs in Sentinel 880 Exposure Camera
- Lessons Learned INL-2017-0043, Inadequate Experiment Safety Analysis
- Lessons Learned INL-2017-0044, Inadequate Change Control of New Calculation Method Results in Potential Violation of a Pressure Limit
- Lessons Learned INL-2017-0045, Questioning Attitude about Legacy Items
- Lessons Learned INL-2017-0046, Misplace LO/TO Keys
- Lessons Learned INL-2017-0047, Failure to Meet Minimum Staffing Requirements during Core Change Result in TSR Violation
- Lessons Learned INL-2017-0048, Idaho National Laboratory Quarterly Occurrence Analysis—4th Quarter FY-2017
- Lessons Learned INL-2017-0049, Fire Sprinkler Actuation due to Excessive Heat Discharge from Load Bank
- Lessons Learned INL-2017-0050, Possible Foot Injury when Floor Vent Fails
- Success Story, Off-gas Test Equipment Review Conducted
- Best Practice, INL-2017-0035, Innovative Power Outlet Brackets Save Time and PPE Cost
- Video, Slippery When Wet

Key OPEXShare entries are summarized below.

Rigging Sling Failure during Load Transfer

Lesson INL-2017-0036

Professional riggers were transferring a 4,500-lb lathe in the MFC Fabrication Shop when the sling failed. The lathe was being removed from the facility, destined for excess, and was no higher than 2 inches off the floor. The load dropped to the floor without adverse consequences to people or the facility. The sling was rated for 12,800 lb; workers had followed rigging best practices of ensuring the lift height of the equipment was minimized throughout the move and workers were safely positioned away from the load. Re-creation of the event and inspection of the load surface with a mirror revealed sharp edges on the load surface that was in contact with the sling when loaded.

Issues:

Riggers performed a physical inspection of the lathe surfaces prior to the lift but did not detect sharp edges on the sides of the contact points.

The pre-lift surface inspection of the lathe's contact surface was performed with gloves on (per procedure). Gloves may have lessened the inspector's ability to identify the sharp edges on the sides of the lifting surface.

What We Can Learn:

- Following INL hoisting and rigging procedure, demonstrated by HPI core tool, procedure use and adherence, in conjunction with training, is why there were no adverse consequences.
- When load surfaces are being inspected during rigging walk-downs, the entire contact surface should be inspected for material conditions that could challenge the lifting-equipment's physical integrity. The HPI core tool self-check, using STAR, might have helped detect the sharp edges in contact with the sling.
- Glove removal to allow proper physical inspection of load surfaces would be consistent with the HPI core tool questioning attitude, to reduce a rigging task's largest potential risk of lifting-equipment failure when under load.

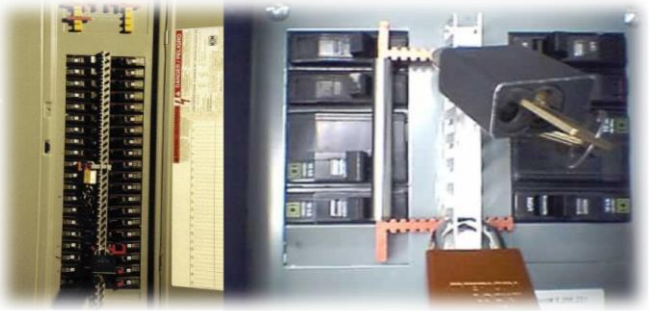
LO/TO Danger Tag Falls off Breaker—Procedure Use Less-than-Adequate

Lesson INL-2017-0037

A danger tag was installed on a two-pole GFCI breaker to support work in Materials and Fuels Complex (MFC) building MFC-725 as part of a complex lockout/tagout (LO/TO). Due to the configuration of the breaker, a locking device could not be installed. This prompted the use of "tag only." Over a month later, during a pre-work walk-down, the building facility manager discovered the danger tag on the inside floor of the breaker panel. The breakers were found in their required LO/TO position of Off.

Issues:

MFC personnel contacted a representative from General Electric (GE) and confirmed that, due to the configuration of these breakers, a standard GE lockout device cannot be used.



Following the event, an aftermarket PowerBloc device was identified and installed on the breaker panel. This new device prevents normal or GFCI single- or double-pole breakers from being operated. This method allows for positive control of the energy source with the use of a lock.

What We Can Learn:

- Plant personnel should explore additional available options to provide supplemental means of protection for breakers that cannot be locked out using equipment on hand.
- Core HPI tools questioning attitude and take a minute may have identified the aftermarket PowerBloc device (http://www.powerbloc.com) that can be installed on the breaker panel to ensure positive control.
- Core HPI tool procedure use and adherence would have caused workers to look for supplemental means as stated in Laboratory Wide Procedure (LWP)-9400, "Lockouts

and Tagouts," which states, "Use supplemental protective measures such as wedges, key blocks, adapter pins, or self-locking fasteners that physically secure the isolation device or when opening, blocking, or removing an additional circuit isolating element, tagging two isolation points in a series, or removing a valve handle."

Smoke from Laboratory Oven

Lesson INL-2017-0038

A researcher was drying a research sample inside a laboratory benchtop oven using an approved "performer-controlled activity." The researcher left the laboratory and, after a short period, returned to witness smoke coming from the oven. The researcher informed their principal researcher (PR) about the situation. The oven was de-energized, the sash on the chemical fume hoods was opened to expedite smoke dissipation, and the laboratory was evacuated. There was no visible fire or evidence of flames. The PR consulted with a colleague about a possible fire concern. Collectively they chose a conservative approach and called 911 and management.

The Idaho Falls Fire Department responded and, upon investigation, found no fire or carbon monoxide concern. The researcher and PR were experiencing a slight irritation in their throats, so they were accompanied to INL medical for evaluation.

Following the event, the researchers followed up with their colleagues who heat similar materials; no other concerns comparable were reported to have been observed. It is possible that an abnormal sample was dried or other materials were present in the oven. laboratory management will continue to monitor heating abnormalities.

What Was Done Correctly:

The laboratory management team (laboratory managers and laboratory space coordinators) set expectations prior to entering the laboratory and initiating research so that employees know how to respond to abnormal operations.

The PR established work controls for the project and briefed the researcher about the laboratory hazards and mitigations prior to research.

A laboratory research mentor was identified to ensure that the researcher operated within the safety envelope. The use of ovens to dry research materials was within the reviewed and approved research scope.

The PR integrated the researcher into the laboratory and regularly observed the researcher. A trusting relationship was developed with the researcher.

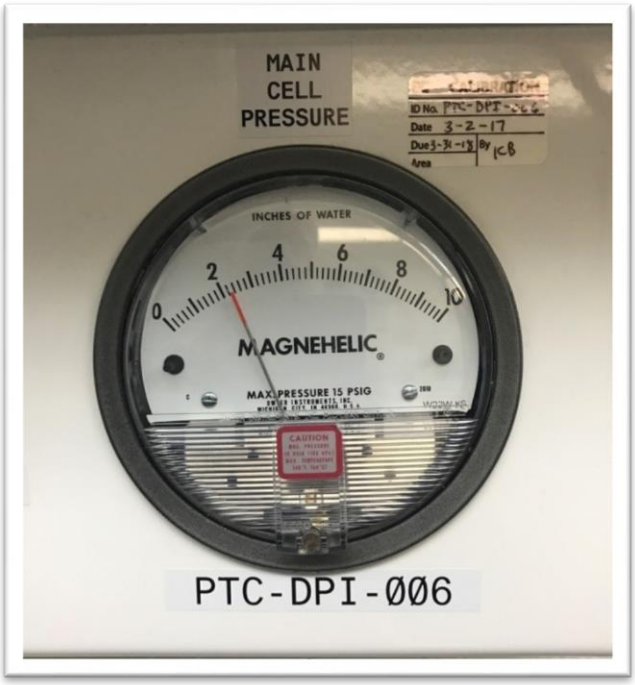
The researcher was aware of their surroundings, positively communicated an unexpected reaction (smoke coming from the oven) to the PR and appropriate response organizations.

A colleague provided guidance and supported the researcher and PR by getting actively involved in the decision making process

Leaking Rainwater Leads to Loss of Main Cell Pressure and Temperature Controls

Lesson INL-2017-0039

Rainwater was observed leaking into the basement and onto an electrical panel that feeds 480 volt power to panel MCC-HA in the Hot Fuels Examination Facility (HFEF) at MFC. Water leaking into the basement of HFEF is a recurring problem whenever heavy rainfall is experienced; previous efforts to stop water from leaking into the basement have not been successful. To mitigate the potential electrical hazard caused by the water on the electrical panel, the area around the electrical panels was barricaded to prevent or control access to the area. The decision was made to isolate and lock out power to the electrical panel and have electricians perform an inspection of equipment inside the panels.



One of the electrical loads from MCC-HA provides a secondary power source (commercial power) to Control Panels CP-4 and CP-6. The primary power source to the CPs-4 and 6 is supplied by a standby power panel via an automatic transfer switch. Approximately 30 minutes after power had been secured from MCC-HA (secondary power source to CPs-4 and 6), CPs-4 and 6 unexpectedly shut down. The loss of CP-4 interrupted control panel communications to the visual electronic-touchscreen console hardware and shut down cell recirculation blowers used for cell cooling. The loss of CP-6 affected building alarms and equipment, specifically the loss of communications to the building O_2 monitoring system. Due to the loss of communication, all O_2 monitors in HFEF began to annunciate, which resulted in an evacuation of HFEF and a response from the INL Fire Department. All HFEF personnel evacuated from HFEF, and accountability was completed. The INL Fire Department entered HFEF and confirmed that HFEF experienced no actual low oxygen levels; the O_2 monitor alarms had been caused by the loss of communications with CP-6. HFEF was released by the Fire Department for reentry.

What We Can Learn:

- Accepting and developing work-around methods for a deficient condition, in this case, rain water intrusion, is not a winning strategy. Addressing the root cause in a timely manner will eliminate the need for costly future responses.
- Automatic transfer switches should include a method for operations to indicate power sources available, position, and power source being used to supply facility equipment. Routine surveillances are a method to validate equipment reliability and status control, Core HPI Tool: Questioning Attitude.
- Operators should receive extensive system training and be trained in the use of critical thinking techniques to help them better understand equipment responses, instrument indications and promote a response to abnormal and emergency events that has been thoroughly analyzed before they respond to conflicting or confusing displays.
- Engaging management early in a response to abnormal events to provide oversight function is beneficial. This is an example of the core HPI tool self-checking using STAR. Early oversight engagement would have provided an opportunity to recognize correlations and discrepancies in indications that personnel involved in the heat of the response did not recognize.
- New systems should have HPI evaluations to eliminate potential error precursors (i.e., gauges that read a common pressure should read the same negative pressure on the same side of zero).

Portable Radio Battery Fire

Lesson INL-2017-0040

A lithium battery for a portable radio self-ejected from a battery charger and caught fire in the guard post for the Specific Manufacturing Capability (SMC) facility at INL. The security officer on duty at the post saw the battery eject from its charger and land on the floor with a small flame coming from it. The officer extinguished the flame with a bottle of water. The photo shows both the affected battery and an intact battery.

What We Can Learn:

- If possible, monitor batteries as they are being charged; although battery failures are infrequent, they can come with little or no warning and could result in damage to facilities if not identified promptly.
- It is advisable to have fire suppression equipment, such as an ABC extinguisher, available near battery-charging areas.
- Follow manufacturer's instructions for charging each specific type of battery, recognizing that batteries that can operate the same radio may be manufactured differently. Chargers used for lithium polymer, lithium ion, NiCad, and NIMH may be compatible, but how and when to charge batteries of differing chemistries may not be the same.
- It is important to identify whether a battery can remain on a charger once it has been completely charged.
- Lithium polymer batteries have a very slow discharge rate when not in use, so they keep their charge much longer and do not need to be left on a charger once fully charged.
- Other batteries may remain in the charger until needed, even when fully charged. Again, follow the manufacturer's recommendations.
- Other considerations:
  - Periodically check that battery and charger contacts are clean; they may continue to apply a charge to a completely charged battery if dirt or debris inhibits adequate contact
  - Charge batteries on a non-combustible surface and away from other combustibles
  - If a battery has been dropped or if there is any concern for physical damage, it should be removed from service
  - Lithium polymer batteries are best charged when the battery is warm or has reached room temperature. If a battery of this type is left out in the cold, it is best to bring it inside and warm to room temperature before placing on a charger

Lockout/Tagout Violation by Quality Assurance Inspector

Lesson INL-2017-0041

A Quality Assurance (QA) inspector failed to sign onto a LO/TO before entering a maintenance work area. The QA inspector was called to perform a fit-up inspection on a pressurizing-pump support stand. The QA inspector proceeded to the work location and bypassed checking in with Operations due to a large number of personnel already waiting to speak with operations personnel.

Upon arriving at the work location, the QA inspector obtained the work order (WO), and without reviewing it, turned directly to the attached weld data sheet (WDS) and proceeded to perform the inspection. The QA inspector missed the LO/TO requirement when he bypassed Operations and did not review the WO and the associated LO/TO prerequisite instructions.

The QA inspector made several entries into the work area over the shift before realizing they needed to be on a LO/TO for the work evolution. Upon realizing the error, the QA inspector immediately exited the work area and contacted Operations and the QA supervisor.

ATR Operations quickly confirmed that the QA inspector had not hung a personal lock and danger tag for entry into the maintenance work area. The LO/TO work group acceptance had been completed on an earlier date for the QA work group, as other QA personnel had performed earlier inspections on this WO.

Issues:

- There was self-perceived time pressure by the QA inspector to complete the inspection as quickly as possible so that work could continue.
- The WO required the QA inspector to be on the LO/TO. Assumptions of WO requirements were made because most shop fabrication WOs have a simple step for welders and QA that refers them to the attached WDS for instructions.
- No maintenance boundary signs were in place at the work location. Signs indicating a Contamination Area (CA) boundary were in place, but no signs that indicated it was a controlled maintenance work area. This error was recognized, and maintenance signs were immediately posted.

What We Can Learn:

There is always time to do the job correctly the first time. Even when a task seems familiar, it is important to use HPI tools to stop and think about what needs done prior to entering a work area. Reviewing work instructions and validating that prerequisite requirements are complete is not only essential, it is mandatory to assure work evolutions are performed safely.

- The QA inspector missed an opportunity to discuss work hazards and mitigations when he bypassed Operations. This conversation ensures hazards and hazard mitigations are known and understood prior to entry.
- Pre-job briefs are required in order to communicate specific information such as hazard and hazard mitigation, including LO/TO requirements. This ensures that the appropriate people are contacted, i.e., the job supervisor and Operations, prior to work.
- Procedures are in place to ensure consistently safe and accurate work completion with predictable outcomes. Personnel are required to follow procedures with 100% accuracy. Assumptions about procedural steps based on previous procedure use is an error trap that must be avoided.
- It is important to post the appropriate signs for maintenance boundary areas. These signs communicate contact information for authorization to enter work areas

Failure of New Locking Springs in Sentinel 880 Exposure Camera

Lesson INL-2017-0042

An INL radiographer was performing annual maintenance on the locking mechanism of a QSA-Global Sentinel Exposure Camera Model 880. This maintenance requires the replacement of the front lock spring. During maintenance, a source is removed from the exposure camera and the front lock is disassembled. A new lock spring is installed, and the auto-lock mechanism is re-assembled and tested.

After the lock mechanism was reassembled, a functional safety test was performed on the automatic lock. During this test, the new spring failed to engage the lock with an audible click. The manufacturer instructions state "if a smooth operation is not attained and/or the lock slide can be forced into the secured position by testing for positive engagement, disassemble and thoroughly re-inspect for faulty components."

Because the lock did not show a positive engagement after challenging, the lock mechanism was disassembled and re-inspected. The radiographer noticed that the newly installed spring was shorter than the length of the originally installed spring. Another new spring was installed, tested, and disassembled with the same result.

The old spring was found to be slightly shorter than the new springs which is expected from a years' worth of use, but still engaged the lock with an audible click. The 6 springs listed as

new were all purchased at the same time during October 2017. Two shorter springs were installed into the camera and tested during the lock challenge. After the challenge tests failed, the new springs were removed and found to be 3/32 in. shorter than the installed length.

The failure of the lock spring could result in a loss of control of a radiography source by failing to auto-lock the source in place. QSA Global, the manufacturer and supplier of the springs was notified of the problem, and new springs were shipped overnight to INL. Notifications were made to other BEA owners of QSA-Global 880 exposure cameras, Fluor Idaho Radiological Control Management, and the Department of Energy-Idaho Operations Office (DOE-ID). The radiography source is not re-installed in the 880 camera during this maintenance evolution, so no radiation exposure to involved personnel occurred.

Issues:

- A Functional safety test was performed on the automatic lock. During this functional test of the lock, the new spring failed to engage the lock with an audible click.
- After a few lock cycles during the test, the new springs were removed and found to be 3/32 in. shorter than the installed length. The failure of the lock spring could result in a loss of control of a radiography source by failing to auto-lock the source in place.

What We Can Learn:

- Operability tests are crucial to ensure equipment is functioning properly after modifications or maintenance.
- Users should be aware that even though equipment is new, it is still subject to failure.

Inadequate Experiment Safety Analysis

Lesson INL-2017-0043

A review of a Boise State University (BSU) Experiment Safety Analysis (ESA) revealed a discrepancy. The ESA handling requirements were for a configuration not supported by the thermal-analysis Engineering Calculation and Analysis Report (ECAR)-2992. The thermal analysis only analyzed handling an individual experiment basket, rather than the three baskets in the current configuration.

The BSU experiment had not been irradiated at the time of discovery and was still controlled under the BSU Compliance to the Generic ESA. Had the BSU experiment been irradiated, the potential consequence would have been an unanalyzed condition for cooling during handling and canal storage. The ESA was revised to add commitments for handling the experiment baskets so the ESA properly included compliance to safety requirements based on ECAR-2992.

Issues:

- There was no description, via drawing or part number, included in the ECAR indicating what was being analyzed with respect to the experiment baskets.
- An assumption was made by the ESA author and reviewers while preparing, reviewing, and approving the ESA that the thermal analysis was performed with the experiment baskets inside of a 3-hole basket holder.
- No validation of this assumption was performed during the nuclear safety review of the ECAR or the preparation, review, or approval of the ESA. During the nuclear safety review of the ECAR, the configuration needs to be understood, as to what was analyzed, and then validated for consistency during the ESA development and review.

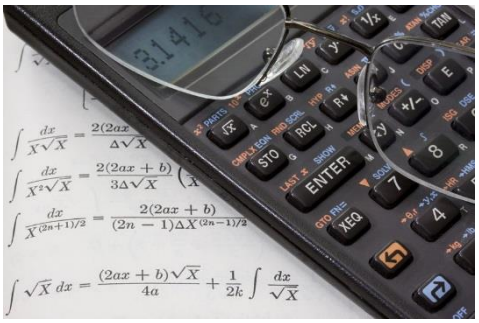
What We Can Learn:

- When performing reviews on analyses supporting the safety of the experiment for use in the ESA, it is critical to perform verifications of drawings and parts to fully understand the configurations being analyzed.
- During the preparation and reviews of the ESA, any assumptions regarding configuration of the experiment analyzed must be validated by drawing and part number and, if needed, communicating with the analyst.
- Additional direction can be included via the ESA preparation procedure to validate configuration (specific to drawing and part number) so that the ESA compliance to safety requirements reflects what has been analyzed.

Inadequate Change Control of New Calculation Method Results in Potential Violation of Pressure Limit

Lesson INL-2017-0044

An engineer (Engineer No. 1) for the ATR questioned using nominal loop pressure to calculate the maximum allowable scram value for the inlet and outlet bulk-water temperature. The concern was that nominal loop pressure was not conservative enough because loop pressure could potentially drop below nominal without alerting operators to perform the required action until the low-pressure alarm set point was reached. This concern was brought to the attention of the Experiment Engineering technical lead, who began to search for documentation that supported the current calculation method. Following further discussion and a positive operability determination, a potential inadequacy in the safety analysis (PISA) was declared.



Interim controls were put into effect to ensure inlet pressure was maintained in the nominal control band with the additional requirement that a manual scram be required if inlet pressure dropped below the bottom of the nominal control band for more than 5 minutes. There was no perceived sense of urgency to make changes to experiments not in the current cycle, but changes would be required for subsequent cycles. Changes to the ESA did not occur.

The following month, in preparation to startup for the next cycle, a second engineer performed the experiment verification. When Engineer No. 2 began to examine the contents of the experiment folder, it was discovered that there were calculation worksheets with two different power levels on them, which was expected because the experiment was to be irradiated during different cycles; however, it was not noticed that one of the calculation worksheets had been superseded.

The original calculation worksheet showed a maximum request lobe power of 40 MW was used instead of the revised calculation worksheet. As a result, an opportunity to catch the fact the experiment ESA had not been updated was missed.

Approximately one week later, ATR obtained full-cycle specific power and operated for approximately 14 effective full-power days (EFPD), during which the nominal source lobe power for one lobe was 37.8 MW. The approved ESA for the experiment still stated that the maximum requested lobe power was 40 MW, even though at that time it should have been revised to 30 MW.

A week later, in preparation to startup for a new cycle, Engineer No. 1 performed the experiment verification process per the "Loop Experiment Verification Checklist." While performing the verification, it was discovered that the ESA for one experiment was never updated. The Experiment Engineering manager was immediately notified of the issue. A new set of calculations was performed which revealed the experiment had met the requirements of the Safety Analysis Report (SAR) and existing PISA interim controls.

Issues:

- After performing calculations based on the low-pressure scram set point, a lower power limit was required to show adequate protection as required by the SAR. Engineer No. 1 was aware of the requirement to revise ESA, but failed to do so. Circumstances such as time pressure, high workload, and the fact that it was the first time performing a change to the worksheet after the ESA was approved contributed to the mental lapse.
- The INL PISA process requires a checklist be used to document the action necessary to implement an interim control. However, the ATR facility specific instruction does not require a checklist be used. This contributed to missing the necessary revisions to the ESA.
- While performing experiment verification, Engineer No. 2 did not recognize that "SUPERSEDED" had been written across the worksheet because he expected multiple worksheets for differing cycles. There is no formal method defined to address superseded documents in an experiments package.
- The ESA is a document controlled within the Electronic Document Management System (EDMS). When changes are necessary to those documents, a formal change should be submitted to flag the required revisions prior to the next use.

What We Can Learn:

- The situation leading up to the event that required a change to the ESA was unique in the sense that the worksheet is not generally revised after the ESA is approved. Changes to an in-process ESA usually occur because the test sponsor has requested a formal change, and a process exists to document and track the changes. When unique situations arise and require change from usual processes, ensure adequate change controls are used to correctly implement the new process.
- An interim controls implementation checklist should be used to ensure all necessary direct and indirect actions are completed. Other potential situations where an incomplete procedure may allow an error should also be evaluated.
- Develop a formalized method to address superseded documents in work packages, such as adding steps to the experiment safety analysis document.
- Use the processes available as they are in place to prevent mistakes. If a formal document change had been submitted stating that the ESA needed the max power revised prior to the next run, then this error likely would have been caught during the revision process prior to the second run and prevented potential for operating over-powered.

Questioning Attitude: Contamination Identified on Legacy Item

Lesson INL-2017-0045

Modifications and paint removal were being performed on a spare cask stand at MFC in preparation for repurposing the stand. Radiological controls personnel were asked to free release the stand so it could be transported off-site for further work. While conducting surveys to support free release of the stand, health physics technicians located fixed contamination in one spot of the disassembled stand catwalk. There was no loose surface contamination detected in any area or on personnel. Items and tools associated with the cask work were surveyed and appropriately controlled.

Issues:

- Accurate and complete records were not readily available to the system engineer. The cask stand was believed to have been used in the mid to late 1990s. It was placed in a laydown storage area around 2006 and has not been used since.
- There were no visible labels affixed to the stand to indicate the presence of fixed contamination or radioactive material, and the stand was not in an area marked for storage of radioactive material.
- Grinding and cutting on contaminated items requires Radiological Control coverage and a radiological work permit (RWP). While this event did not spread contamination, it potentially could have.

What We Can Learn:

- Do not rely on legacy items, systems, and components to be appropriately categorized and characterized. The HPI core tools take a minute or stop when unsure would have provided an opportunity to validate the information provided and challenge assumptions.
- A questioning attitude, another HPI core tool, was instrumental in ensuring Radiological Control personnel were engaged to identify, assess, and control the situation before further work was performed.

Misplaced Lockout Tagout Keys

Lesson INL-2017-0046

Auxiliary operators at ATR were assigned the task of completing the installation of five LO/TOs in preparation for work the following morning. One LO/TO was for the Upper Vessel Emergency Firewater Injection System (EFIS) pilot-valve replacement. This LO/TO was partially installed by the previous shift, but required four more isolations to be complete.

The lead senior reactor auxiliary operator (LSRAO) performed the initial positioning for the four isolations, and the senior reactor auxiliary operator (SRAO) installed the locking devices and locks. The SRAO installed locks on two nitrogen bottles and set the two keys on some scaffolding (about 5 feet high and just 2 feet away from the nitrogen bottles) while updating the LO/TO record sheet.

The SRAO then went to place the LO/TO keys into the lockbox and forgot about the two keys on the scaffolding. The SRAO did not count the keys prior to placing them in the lockbox.

A third check of the LO/TO installation was performed by the plant foreman prior to the end of the shift, but the foreman did not notice on the scaffolding. Employees performing the walkdown of the LO/TO, prior to the first work group acceptance, and the workers using the scaffolding while performing work under the same LO/TO did not notice the keys.

Two days later, while preparing to clear the LO/TO, workers discovered that the two keys were missing from the lockbox. Operators searched and found the keys on the scaffolding.

What We Can Learn:

- It is essential to take all the time needed to perform work accurately and safely. Time pressures, increased workload, and complacency are error precursors we all face. Strong use of human-performance tools can help prevent these error precursors from leading to errors.
- There is no room for error while performing ANY tasks associated with a LO/TO. Proper adherence to the LO/TO process ensures that we have isolated hazardous energy so personnel can perform work safely and without injury. Every step of this process needs to be performed methodically and deliberately. If an unexpected condition is encountered, remember to cultivate a questioning attitude.

Failure to Meet Minimum Staffing Requirements during Core Change Resulted in Technical Safety Requirement Violation

Lesson INL-2017-0047

At ATR, a failure to meet minimum staffing requirements resulted in a Technical Safety Requirement (TSR) violation. During the performance of detailed operating procedure (DOP)-4.20.4.4, “Removal of Powered Axial Locator Mechanism (PALM) Drive Unit on a Standard Inpile Tube,” the test train was manually lowered into the inpile tube after it became disconnected from the PALM drive unit. At the time the evolution occurred, the reactor core was fueled.

The definition of a core change in TSR-186 is, “the manual movement or manipulation of any component within the Core Reflector Tank with two or more FUEL ELEMENTS in the

reactor CORE. The manual movement of components (e.g., SAFETY RODS) using their normal drive mechanisms is not considered a CORE CHANGE, however, the movement of these components with their normal drive mechanism disconnected is considered a CORE CHANGE." Additionally, the TSR-186, Administrative Control (AC) 5.3.2.1.D states, "during core changes other than through the reactor vessel refueling ports, an SRO certified for fissile material handling, shall directly supervise personnel performing the changes."

For this particular evolution, the individual directing the work was working towards obtaining the Sample Handler Job Supervisor Qualification and was being observed by a job supervisor (JS) qualified as an on the job training (OJT) instructor. The OJT instructor was ultimately responsible for the work being done. At the point the test was being manually lowered, a note in the procedure required a senior reactor operator (SRO) to be present. The SRO was not present due to an oversight by the trainee and the JS. Not having the SRO present resulted in a TSR violation.

Issues:

- The JS/OJT instructor did not recognize that the note indicating the need for an SRO to be present had been omitted before workers began to manually move the test.
- The requirement for meeting the TSR if there is fuel in the core was contained within a note, not a step.
- The TSR requirement referenced in the note only pointed to ensuring the log count-rate meters were in service, not specifically to the requirement for an SRO to be present. However, the note does state to review the precautions and limitations, which speak to the requirement of an SRO to be present during a core change, prior to initiating the core change.
- The note containing the TSR requirements was not performed or verbalized by the person under instruction.

What We Can Learn:

- It is essential for OJT Instructors to assess the experience of the individuals under their instruction and more closely supervise when appropriate.
- When directing work to others from a procedure, read all warnings, cautions, and notes aloud to give all involved a chance to question the actions about to be performed.
- Procedure compliance is essential to assuring personnel safety, protecting the environment, minimizing equipment damage, ensuring operation within established and approved parameters, and promoting consistent, reliable, and proficient activities that yield quality results.
- With something as important as a TSR requirement, the information should be in a step, and not in a note within the procedure.
- When it is known that essential personnel will be required during execution of a procedure, ensure that they remain in the area for the entire work evolution.
- Placekeeping is important, not only for steps, but also for additional information in the procedure such as notes.

Fire Sprinkler Actuation Due to Excessive Heat Discharge from Load Bank

Lesson INL-2017-0049

While performing the annual battery rundown test on the 480 V uninterruptible power supply (UPS) in the ATR laydown area, an Automatic Voice Announcement System warning was initiated directing evacuation of non-essential personnel from the building due to water flow in a fire sprinkler system. This annual rundown test had been performed successfully once before on each battery, for a total of two executions.

The fire sprinkler system was actuated due to excessive heat being discharged from a SIMPLEX Dynamite 400kW portable load bank.

The load bank is designed to discharge heat up to 300°F in an upward direction and was located directly beneath a fire sprinkler head. The fire sprinkler system for this space covers the 480 V bus UPS room and battery rooms. Operations quickly secured power to the 480 V UPS and attached load bank, opened disconnects for the battery banks, and isolated the water to fire riser system No. 7.

Issues:

- Previous success using this and other load banks diminished any concern over heat output. The same load bank had been used in the same location, as well as other locations with no adverse results. Similar load bank equipment had been used in different locations for the same purpose with no adverse results.

- Locating the battery rundown equipment in close proximity to fire protection heads was not in accordance with manufacturer's warnings.
- Work control documentation did not contain any warning about placement of equipment near fire protection equipment.

What We Can Learn:

- It is important that workers understand equipment and the equipment limitations along with potential hazards associated with its use.
- The importance of incorporating the manufacturer's warning into our work control documentation to avoid taking unnecessary risks.
- It is important to review work and understand the risks associated with performing work and the need for proper mitigation of hazards.

Possible Foot Injury when Floor Vent Fails

Lesson INL-2017-0050

A University of Idaho employee was walking in an office cubicle in the Center for Advanced Energy Studies (CAES) when the employee stepped on a failed floor vent. When the employee's foot went thru the vent, the heel of his boot became stuck in the vent. The employee was wearing sturdy leather boots which prevented injury.

A review found that the high impact plastic beauty ring that holds the vent housing in place was cracked and failed due to impact from foot traffic, equipment, rolling of cubicle chairs, etc. Idaho State University Facilities personnel replaced the broken vent cover within 15 minutes of the accident and then checked all of the vents in CAES for cracks or wear.

Extra rings were ordered to keep on hand, and facilities staff personnel were informed to watch for this type of issue on an ongoing basis as they vacuum or walk through the facility.

What We Can Learn:

- Ensure that any floor grating, vents, or vent housings are inspected for cracks and failure.
- Wearing appropriate footwear in this case prevented injury and is important, even in office settings.

Video: Slippery When Wet

INL produced a video discussing slips, trips, and falls that account for twenty percent of INL's workplace injuries.

Success Story: Off-gas Test Equipment Review Conducted

In response to lessons learned "Unexpected Gas Release" detailing the release of a toxic gas at the Oak Ridge National Laboratory, a system walk-down was performed in EIL LAB B-214 at the Idaho National Laboratory. As the INL off-gas test equipment incorporates gases with similar hazards, line management determined the necessity for a follow-up discussion.

Of specific concern was the release of toxic gases outside of containment. The walk-down and discussion with the primary researcher indicated that risk of release is remotely low, barring abnormal hood operation. A loss of hood flow is also identified in the LI and appropriate response is well understood by those involved. This is a good example of using operating experience to review related equipment for common hazards.

Best Practice: Innovative Power Outlet Brackets Save Time and PPE Cost

Lesson INL-2017-0035

How many of us can say there is a tool or product that bears our name? Probably not that many. But an ATR Radiological Control technician (RCT) and supervisor can—the BrigMar Bracket.

RadCon personnel saw a need to modify how power outlets were used in the ATR canal area. Previously, anybody who needed to plug into or unplug from an electrical outlet in the canal area would need to contact RadCon because the outlets were in a Contamination Area (CA). Entering the CA, required personal protective equipment (PPE) for each entry, to plugor unplug each piece of electrical equiptment.

The BrigMar bracket made the outlets accessible outside of the CA. They worked with others to review, build, and approve the new bracket. There are now two BrigMar Brackets installed in the canal. One consists of outlets for power, the other is to connect cables to television monitors and computers. The new brackets will save time and the cost of PPE every year to plug and unplug equipment and monitors.

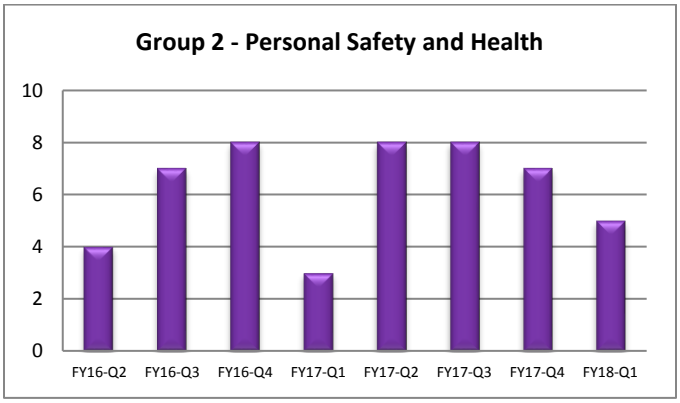
1st QUARTER FY-18 GROUP 1: OPERATIONAL EMERGENCIES

No operational emergencies were reported at INL during 1st Quarter FY-18. The last operational emergency at INL was reported in April 2012 when boron triflouride gas leaked from a neutron detector (NE-ID--BEA-INLLABS-2012-0003). The rate of occurrences of operational emergencies continues to trend at zero.

1st QUARTER FY-18 GROUP 2: PERSONNEL SAFETY AND HEALTH

TREND SNAPSHOT

Personnel Safety and Health Events: During 1st Quarter FY-18, there were five reportable events related to personnel safety and health (e.g., occupational injuries, occupational exposures, fires, explosions, or hazardous energy events). Five additional non-reportable events were communicated via Initial Notification Reports and are related to this group's reporting criteria. There was a decline in the number of reportable and non reportable events from last quarter.



The reportable and non-reportable events occurring during 1st Quarter FY-18 are summarized below.

Discovery of Uncontrolled Hazardous Energy Source in the Neutron Radiography Reactor Elevator Control Cabinet

NE-ID--BEA-HFEF-2017-0002 (Report Level Low)

A DOE Facility Representative notified the Hot Fuel Examination Facility (HFEF) facility management of a partially open door to an electrical control cabinet for the Neutron Radiography Reactor (NRAD) elevator. The cabinet is labeled as having exposed 120 volt electrical components. Tape was used to secure the door closed in lieu of a latch because a 5V communication cable had been run thru the door opening, preventing it from being fully closed.

A critique of the event found that communication line installation activities performed in the spring of 2016 left the NRAD elevator control console in a modified and noncompliant condition. An extent of conditions was initiated to look for similar problems that may have occurred during the communication line installation project.

The critique found that the engineering work package was signed off as completed even though an electrical code non-compliant condition existed following work. The process engineer approved the working system with the non-compliant configuration with the understanding that the system would be rewired by Instrument and Control technicians to meet code at a later date. This rewiring did not occur because of a high workload on Instrument and Control technicians supporting HFEF activities.

What We Can Learn:

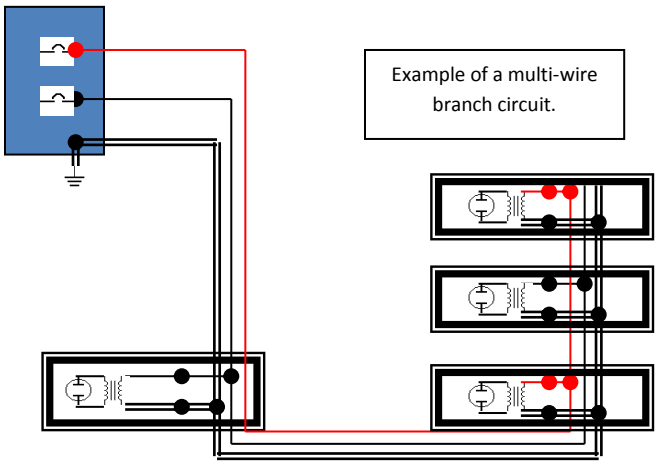
- Work packages should sufficiently communicate the as-left condition so that persons reviewing the package for completion will fully understand the final configuration.
- Unless work is completed as planned, it should not be signed off and should never be left in a non-compliant condition unless additional controls are in place to mitigate any hazards present.

Discovery of an Edison Circuit at the Hot Fuels Examination Facility

NE-ID--BEA-HFEF-2017-0003 (Report Level Low)

Work was being performed to replace a wall receptacle in the entrance of the HFEF; a LO/TO was required for this activity. A panel schedule for N-LP-R1C and HFEF's normal power drawing were used to develop the boundary for the LO/TO. A minor work package, "Troubleshoot and Repair an Entry Way 120 V Outlet," was approved for work, and a roundtable meeting of the work request was initiated. During the roundtable, there was no discussion about the potential for Edison circuits, although a discussion of this subject is required per MFC procedures.

The job began, and breaker 24 (powered by panel N-LP-R1C) was locked out. A zero energy check was performed, and work began to replace the outlet. The electrician wore appropriate PPE during performance of the zero-energy check and removed the rated gloves to replace the outlet.



A short time later the nuclear facility manager (NFM) noticed flickering of his computer (powered by Breaker 20) and notified the electrician, who was in the process of replacing the outlet. The electrician confirmed there was no power at the outlet. Work on the outlet was completed, and the outlet cover replaced. The electrician removed the LO/TO from breaker 24. Additional investigation discovered that Breaker 22, located directly above Breaker 24, was tripped and an administrative lock was placed on Breaker 22.

Later that afternoon, the NFM and electrician discussed the potential of an Edison circuit. Based on facility conditions, the recent replacement of panel N-LP-R1C and the circuit at the outlet not appearing to be an Edison circuit, the presence of an Edison circuit could not be confirmed.

The following week, the system engineer was notified and began reviewing drawings to confirm or deny the presence of an Edison circuit. After reviewing the original building construction drawings, the engineer identified an Edison circuit associated with N-LP-R1C Breakers 20, 22, 24. The system engineer contacted the facility shift supervisor and confirmed the potential for an Edison circuit.

An investigation into the event found that the power panel was replaced in 2014, but was not updated to current code requiring Edison circuits to be on a tandem breaker. Additionally, the roundtable discussion should have covered the potential for the presence of an Edison circuit, and the original construction drawings should have been reviewed during work planning.

What We Can Learn:

- MFC has experienced one other ORPS-reportable event in the past 12 months involving work on Edison circuits. An extent of condition was performed, and it was determined that Edison circuits are present in most MFC facilities. Additional controls (procedural requirements and training) were implemented, but those controls did not raise awareness sufficiently for personnel.
- Labeling panels known to contain Edison circuits can help identify potential problems before work begins.
- Fluor Hanford prepared a PowerPoint presentation on the potential hazards with neutral conductors. This can be found at the link below. The presentation shares some good lessons, including: https://www.lanl.gov/safety/electrical/docs/neutral_hazards.ppt
    - If known, lockout out both (or all) load breakers. If both circuit breakers in a multi-wire branch circuit are not known, test the neutral circuit with a clamp-on current detector to identify whether the neutral is carrying current before lifting neutral leads or breaking a neutral connection.
    - Treat the neutral as energized even though the circuit is locked out at the source. Measure absence of voltage to ground immediately after lifting leads when more than one neutral is lifted from a device or when a splice is broken.

Discovery of an Uncontrolled Hazardous Energy Source in the Manipulator Repair Group Glovebox Room

NE-ID--BEA-HFEF-2018-0001 (Report Level Low)

Manipulator Repair Group (MRG) personnel were working in the MRG room when one of the workers noticed the outlet cover was broken on a 120 volt duplex receptacle and the electrical conductors were visible. The area around the damaged receptacle was barricaded to prevent entry to the area until further evaluation could be completed. Electricians evaluated the area and determined that the damaged outlet cover was not "finger safe," thus resulting in an uncontrolled hazardous energy source.

What We Can Learn:

Be diligent and aware of the actions to take if something just does not look right. Personnel took conservative action and prevented access to a potentially uncontrolled electrical-energy source.

Network Cable Repair done with Less-Than-Adequate Work Control

NE-ID--BEA-MFC-2017-0008 (Report Level Low)

A subcontract network engineer was working in a boiler control cabinet in MFC building 768 to troubleshoot and repair a Cat 5 network cable connection. The engineer was not working to any formal work control ,resulting in hazards not being formally identified and appropriately mitigated. A system engineer was verbally directing the subcontract engineer's work activities.

The system engineer had opened the boiler control cabinet to plug in a 120 volt extension cord without knowing that the cabinet contained exposed 480 volt conductors. Again, this work was performed without any formal work control. After the extension cord was plugged in, the cabinet and was left in a non-compliant condition (door partially open to accommodate the extension cord, and the area was not roped off).

A second job, unrelated to the network cable job, involved electricians establishing a LO/TO on the steam boiler 13.8KV electrical system to support a preventative maintenance activity performed by MFC crafts. Part of the zero-energy check was to be performed in the same boiler control cabinet.

Upon seeing the network engineer in the area, the facility manager questioned whether the engineer was working under the necessary hazard-control procedures as the cabinet contained 480 volt conductors. Further review identified that this work had not been released by the building facility manager and was not being performed with adequate work control in place.

An evaluation of the event revealed that the network cable work was not evaluated for proper work control because the work-release process was bypassed. Because of this, no formal hazard identification and approved work control documents were used.

What We Can Learn:

Work control procedures are in place to ensure work is approved and conducted in accordance with Integrated Safety Management System (ISMS) guiding principles and core functions. If these procedures are not followed, employee safety can be diminished.

Lockout Tagout Noncompliance during Work on Overhead Door

NE-ID--BEA-STC-2017-0005 (Report Level Low)

During closeout of a preventive maintenance (PM) work order on an overhead door at the Security System Laboratory Building, REC-682, the building manager identified a noncompliance to the INL LO/TO procedure. A subcontract employee had performed work on the overhead door without first ensuring the mechanical motion of the door was prevented via LO/TO. No injuries occurred as a result of the noncompliance.

One week prior to discovery of the noncompliance, a carpentry superintendent questioned the need for a LO/TO related to work being performed on the overhead door. The REC-682 building specialist and a hazardous energy specialist verified the doors had been walked down and a hazardous energy map had been generated and communicated to the

superintendent. However, the building specialist did not communicate that the work was authorized to begin without a LO/TO. The building specialist assumed the carpentry superintendent would request that an escorted LO/TO briefing be held prior to beginning work. Several people, including the building specialist, could have performed the briefing.

Following completion of the work, the building specialist noticed none of LO/TO steps in the work order had been signed off. The specialist contacted the workers who performed the work and learned they had not performed a LO/TO because they believed they had maintained exclusive control of the equipment (door, motor, switch) via the overhead-door disconnect switch, located approximately 20 feet above ground level.

It was learned that none of the workers involved in the work had been trained in LO/TO, nor did they have a correct understanding of "exclusive control." In addition, miscommunication regarding the energy map and approval to work led the carpentry superintendent to believe it was safe to proceed without LO/TO. A review of prior work found that only approximately 1% of carpentry work is performed under a planned work order, so personnel misinterpreted the steps for LO/TO.

What We Can Learn:
Clear communications are crucial to safe operations. Communications should be clear, concise, complete, and correct. If someone is unsure of how to complete a task or who is responsible for completing the task, it is imperative that they speak up and gain an understanding of the task.

Other Non-Reportable Events

Smoke From IRC 630 Lab A5

CO 2017-2572

An intern in Idaho Research Center (IRC) Laboratory A5 was drying crushed magnetic material in an oven. He stepped out of the lab for a few minutes and, upon re-entry, noted a slight haze in the lab. He walked to the back of the lab where he

encountered smoke coming from the oven. The intern immediately turned off the oven and opened the sashes to the hood to remove the smoke. He then walked to the PI's office where he informed the PI of the smoke.

The PI and intern returned to the lab, where the PI determined that there was no fire. A neighboring PI called 911, while the PI informed the lab manager as well as the Warning Communications. The Idaho Falls Fire Department responded and verified there was no fire. Fire department personnel checked the area for heat and gasses, and determined the area was free of fire/gasses and cleared the Lab for re-entry.

What We Can Learn:
Lessons learned from this event have already been communicated in the Lessons Learned section of this report.

Lithium Cell Failure in Battery Test Center

CO 2017-2650

On October 17, 2017, a battery test engineer (BTE) for the Battery Test Center requested help from the laboratory space coordinator (LSC) in trouble-shooting some anomalous readings on one of the test systems. The cells in question were in an environmental chamber.

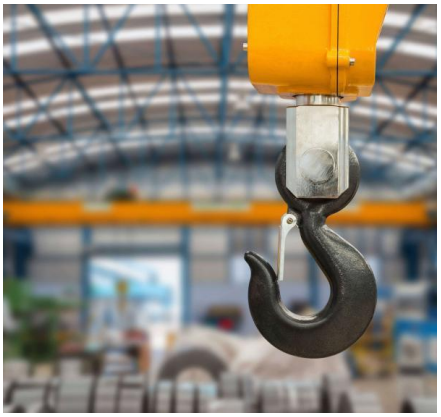
Initial inspection revealed melted foam and plastic in the cable entry port of the environmental chamber. Before proceeding with any further inspection, it was verified that all testing in that chamber was suspended and that there were no abnormal temperatures present. After conferring with the laboratory manager, and following direction in the Laboratory Instruction, the LSC proceeded with the inspection of the chamber. Upon opening the chamber, it was immediately obvious that at least one cell in the chamber had undergone thermal runaway and was almost completely consumed.

Personnel reviewed the photos of the chamber and available data from the tester to determine the best course of action to ensure personnel and property safety. Because there was no ongoing activity in the chamber, and all surfaces were at room temperature, it was agreed that the best course of action was to remove the cells from the chamber and place them in a metal barrel outside the building. Using an arc rated suit and face shield, the LSC cut the cables connected to

the cells and placed them in a metal barrel that was in the back yard of IF-685.

What We Can Learn:
In this particular incident, the Laboratory Instruction were effective in helping mitigate a potentially catastrophic event that could have resulted in damages to the capability and facility and to a loss of production. This event illustrates a clear example of the proactive approach to safety practice that controls a potentially catastrophic situation to create a more manageable one.

Hoisting and Rigging Concern at ATR Machine Shop
CO 2017-2777



Following the installation of a new piece of equipment, a layout table in the machine shop required relocation. Machinists, using shop hoisting and rigging equipment, rigged the table top and lifted it while the base was relocated. An experienced contractor observed the lift and expressed concerns regarding the sling configuration and sling protection being used.

The contractor immediately reported the concern to employees and ATR management. Employees felt the quickest response to the concern was to lower table top onto the relocated base. Work was then stopped, and ATR management responded with the ATR hoisting and rigging technical point of contact.

What We Can Learn:
Uphold a questioning attitude in the performance of pre-job rigging inspections. Remain vigilant in bringing attention to conditions that appear inconsistent with safety in the performance of job activities.

Worker Breaks Thumb Sizing Waste in Dumpster
CO 2017-2994
A craftsman injured their right thumb while breaking down a packaging container to fit into the waste bin. The craftsman sought medical attention, when it was discovered that the injury resulted in a small fracture of the first knuckle area of the right thumb. The worker was released to return to work with a medical restriction on use of the right hand.

What We Can Learn:

Mundane elements can be found in even the most interesting jobs in the world. To ensure you are performing mundane tasks safely, be mindful of what you are doing; don't let your thoughts wander, and remain in the here and now. Purposefully think and do in the present.

Craftsman Injured Lifting Bag of Salt
CO 2017-2995
What We Can Learn:
Employees must be aware of their limitations and should not be hesitant about asking for help if performing a task has the potential to irritate an existing medical condition.

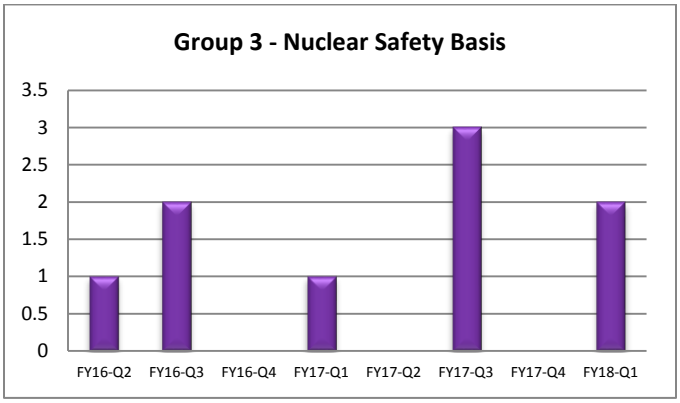
ANALYSIS FOR RECURRING EVENTS:
The number of events reported under Group 2 decreased since last quarter; however, as was the case last quarter, all of the events reported this quarter were related to hazardous-energy control. This represents an uptick in similar events over the past three quarters.

A review of the 20 events reported in the last twelve months under Group 2 Subgroups on hazardous-energy control found that eight involved subcontractors, including two of the events from this quarter; however, upon review, no commonalities that would be indicative of an adverse trend or recurring event were identified with subcontracted work. Of the 20 events, 14 resulted from a failure to follow hazardous-energy-control processes; six resulted in an unexpected discovery of a hazardous energy source. The INL LO/TO subject matter expert (SME) has noted this trend and is performing additional analysis of the severity of the reported events to determine whether additional actions need to be taken.

Finally, a review of the eight other events in this reporting group over the past 12 months was performed. These included seven occupational injuries and one fire. No commonalities exist with the occupational injuries that would warrant further analysis.

TREND SNAPSHOT

Nuclear Safety Basis Events: There were two nuclear safety basis event reported during 1st Quarter FY-18. During the past 12 months, five events have been reported under this group's reporting criteria; four were identifed at the ATR Complex, and one at MFC. An analysis of the events did not reveal any commonalities that would indicate a recurring trend or recurring events.



The number of events reported under these criteria is trending upward over the last two years. Two events reported under this group's reporting criteria during the 1st Quarter FY-18 are as follows.

USQD for PISA at ATR Complex Results in Positive Unreviewed Safety Question

NE-ID--BEA-ATR-2017-0049 (Report Level Low)
A PISA, ATR Complex-USQ-2017-415, "Building Release Rate for a Seismic Experiment Loop LOCA During Reactor Shutdown," was declared.

The building release modeled in the accident dose consequence analysis for a postulated seismically-induced experiment loop loss of coolant accident (LOCA) may not be conservative for facility conditions during reactor shutdown when the building ventilation system is operating and the radiation monitoring and seal system (RMSS) is not available to isolate the ATR stack. Therefore, the calculated dose consequences in ECAR-3442, "Radiological Dose Consequence Associated with Fueled Experiment Damage as a Result of a Shutdown Experiment Loop LOCA," may not envelope the postulated accident conditions. The Unreviewed Safety Question Determination (USQD) declared this PISA to be a positive unreviewed safety question (USQ).

At the time of discovery, the reactor was operating at power with the RMSS operable, and no immediate actions were necessary to place the facility in a safe condition.

Advanced Test Reactor Local Area Evacuation System Disabled

NE-ID--BEA-ATR-2017-0050 (Report Level Low)
A LO/TO was put in place for the 670-E-12 motor control center (MCC) replacement project at the ATR. This LO/TO isolated both power supplies to the ATR local evacuation system and placed the system out of service. The out-of-service condition was discovered four days later.

The ATR evacuation system is required to be in service per SAR-153, Chapter 15.11.3.1. Compensatory measures to use the public-address system, as allowed by SAR-153, were implemented when the issue was identified.

Other Non-Reportable Events

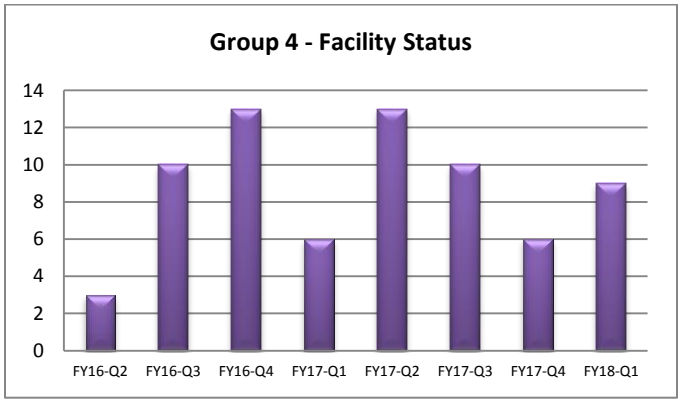
There were no additional non-reportable events related to nuclear-safety-basis problems documented in LabWay during 1st Quarter FY-18.

ANALYSIS FOR RECURRING EVENTS:
Five events have been reported under these criteria during the past 12 months. Four of the events occurred at the ATR Complex and one at MFC. A review of the events found no commonalities that would warrant reporting as a recurring condition or problem.

TREND SNAPSHOT

Facility Status Events: Facility status events accounted for 47% of the events reported in FY-18. Nine events were reported under these criteria this quarter. The rate of occurrence of facility status events is trending slightly upward over the past two years. Seven events reported this quarter occurred at the ATR Complex, one at the Transient Reactor Test Facility (TREAT), and one at Central Facilities Area. All but one of the ATR Complex events were related to performance degradation of SC or SS SSCs. Over the past 12 months, 36 events have been reported at INL under this group's reporting criteria, with 33 of these events occurring at the ATR Complex.

Of the Group 4 events reported in the past 12 months, 83% have been reported as performance degradation of an SC or SS SSC, all but one of which occurred at the ATR Complex. ATR Plant and Project Engineering continues to monitor the health of safety-related systems and systems important to safety. Safety System Report Cards are issued monthly and, if necessary, ATR Engineering initiates action to address any concerns.



The nine events reported under the Group 4: Facility Status criteria during 1st Quarter FY-18 are summarized below.

Advanced Test Reactor Critical Manual Reactor SCRAM Due to Recorder OFF Annunciator

NE-ID--BEA-ATR-2017-0044 (Report Level Low)
During performance of OP-1.2, "ATRC Startup," a recorder OFF annunciator was received and immediately cleared. The reactor was subcritical, and the startup was paused. Advanced Test Reactor Critical Facility (ATRC) annunciator procedure, ATRC-EARM-FR-500, "ATRC Frame 500 Annunciator Panel," was performed, and the reactor was shut down by manual SCRAM. An actual unsafe condition did not exist.

Advanced Test Reactor Confinement Door 39 Seal Failure

NE-ID--BEA-ATR-2017-0045 (Report Level Low)
The seal on the latch side of Door 39 was found with the inner portion on the ground. Door 39 is a confinement door between the ATR reactor control room and the production control coordination center and is required to be operable during POWER OPERATION and for 30 minutes following POWER OPERATION. TSR-186, LCO-3.8.1, Action Statement C, confinement penetration not sealed or credited by building leak rate, was entered.

Advanced Test Reactor Lobe Power Calculating and Indicating System Temporarily Inoperable Due to North N-1 Chamber Signal

NE-ID--BEA-ATR-2017-0046 (Report Level Low)
The ATR shift supervisor declared the lobe power calculating and indicating system inoperable and entered TSR-186, LCO-3.6.1 Action Statement C in response to apparent erroneous indication from the North N-16 channel.The N-16 indication was observed to have decreased from 1.015 to 0.995 for undetermined reasons. During this time, chamber flows were checked and found to be within tolerance, and the potentiometer for North N-16 was increased to bring the indication back to the normal range. Approximately three hours later, the reactor control room received a North N-16 Outer Lobe High Level alarm. The North N-16 channel was observed to have increased from 1.016 to 1.062. All other reactor-power instrumentation was indicating normal, and flow to the North N-16 chamber had not changed.

The lobe power calculating and indicating system is required to be operable during reactor operation. The north chamber is one of four that can be excluded from the power calculation without requiring a reactor shutdown.

Advanced Test Reactor Confinement Door 49 Closure Mechanism Failure

NE-ID--BEA-ATR-2017-0047 (Report Level Low)
On November 1, 2017, the ATR Control Room Supervisor was notified that the closure mechanism for Door 49 had failed and was not capable of causing the door to automatically close and latch. Door 49 is a confinement-boundary door between the reactor main floor and the ATRC office area and is required to have an operable closure and latch mechanism when the ATR confinement system is required to be operable.

Hole Found in Fuel Assembly Cladding

NE-ID--BEA-TREAT-2017-0001 (Report Level Low)

While moving a TREAT fuel assembly to a new core location, a visual fuel evaluation identified a small hole (~1/8 in.) in the fuel cladding. The RCT monitoring the task was directed to perform a contamination survey, which indicated contamination of 90,000 dpm/100 cm^2 beta-gamma. This was above RWP limits for the task, so the fuel assembly was lowered back into the core placing the area in a safe condition.Contamination surveys of adjacent areas were performed, and no contamination spread was detected. Notifications to management and DOE were made. Subsequently an RWP was revised, and the assembly was removed from the core into plastic sleeving for contamination control and placed into storage outside the reactor (INL Condition Report CO 2017-2538). The assembly has been placed out of service, and the core load was completed with a spare assembly being installed. The failure mechanism is unknown at this time.The failed cladding represents a failure of a safety-related SSC because the hole in the cladding prevents the containment of fission products; however, it does not affect the fuel-assembly negative moderator-temperature coefficient or its structural ability to maintain its geometry.Research into the fuel-assembly history found that the failed assembly has been loaded in the reactor core since initial reactor startup in 1959. An investigation and review of historical records indicate the assembly cladding failed sometime prior to 1983, with no indications of the breach from radiological or air sampling in the past. At present, .o determination can be made on the exact time of failure or failure mechanism.

Advanced Test Reactor Confinement Door 44 Found with Broken Crash Bar

CO 2017-3071 (Report Level Informational)
Confinement Door 44 was found to have a broken crash bar. Door 44 is a personnel door into the ATR confinement area. The ATR was in a maintenance outage at the time of discovery, and the confinement system was not required to be operable.

Advanced Test Reactor Primary Coolant Pump Inoperable

CO 2017-2583 (Report Level Informational)
In October 2017, the M-7 primary coolant pump (PCP) pre-lube pump was found to be tagged out for troubleshooting. The pre-lube pump is required to operate to satisfy oil-pressure interlocks before the M-7 PCP is started. Failure of the pre-lube pump would render the associated PCP inoperable.

On September 25, 2017, while conducting PCP run-ins in preparation for reactor startup, it was discovered that the M-7 PCP pre-lube would indicate tripped on the distributed control system shortly after starting from the reactor control room. Further investigation determined the pre-lube pump was actually starting as indicated by local pump-discharge pressure. On September 28, 2017, a simple LO/TO was placed on the M-7 pre-lube pump to troubleshoot the trip indication per WO 252803. The electrician performing the troubleshooting discovered that the auxiliary contact block in the starter was broken. This failure was noted in the work order, and the WO was returned to the production control coordination center.

On October 10, 2017, it was noted that the simple LO/TO was still hanging on the M-7 pre-lube pump, and the control room supervisor was informed. The ATR was operating at full power for the 162A-1 cycle at the time of discovery, with primary coolant flow supplied by the M-6 and M-9 PCPs. The M-7 PCP was not required to be operable.

CFA-625 Alarm Line Left Closed

CO 2017-2615 (Report Level Informational)

During a quarterly riser inspection, an alarm line was disabled until repairs to a clapper valve could be completed. A fire impairment was not processed at the time of the isolation of the valve. The protected premises suppression system was fully operational during this time.

Advanced Test Reactor Local Area Evacuation System Disabled

CO 2017-3170 (Report Level Informational)

A lock out tag out was put in place for the 670-E-12 replacement project; the tag out isolated both power supplies to the ATR local evacuation system placing the system out of service. The ATR evacuation system is required to be in service per SAR-153 chapter 15.11.3.1.

Other Non-Reportable Events

There were no additional non-reportable events related to facility status problems reported during 1st Quarter FY-18.

ANALYSIS FOR RECURRING EVENTS

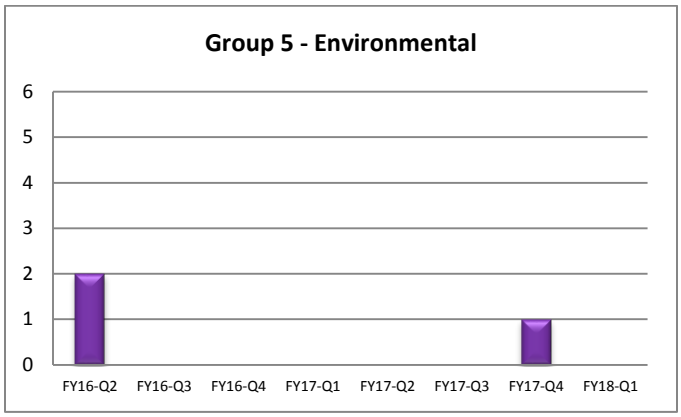
A review of 38 facility-status occurrences that were reported in the last 12 months was performed. Thirty-four occurred at ATR, of which six were related to confinement doors (e.g. latch failures, seal leaks); ten were related to pumps (e.g. firewater, primary coolant pump, deep-well pumps, etc.) and one was related to an emergency diesel generator at the ATR Complex. On a case-by-case basis, ATR management evaluates the need to develop a preventive-maintenance package to minimize the recurrence of common failures associated with confinement doors.

Thirty of the events in the past 12 months were the result of degradation of a safety-class or safety-significant SSC, all but one of which was discovered at ATR. As stated earlier, ATR management has identified this trend and is monitoring performance degradations via system health reports. Additional action will be taken if deemed necessary.

1st QUARTER FY-18 GROUP 5: ENVIRONMENTAL EVENTS

TREND SNAPSHOT

Environmental Events: No environmental events were reported under this group's reporting critieria during 1st Quarter of FY-18. In addition, no non-reportable events occurred during the reporting period. The rate of occurrence of environmental events over the past two years continues to trend downward.



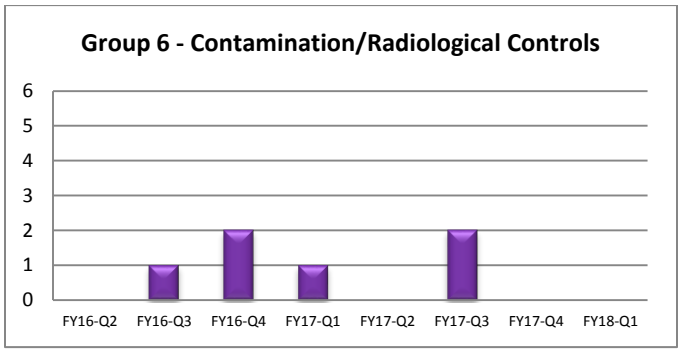
ANALYSIS FOR RECURRING EVENTS:

There has only been one reportable event in this reporting group during the last 12 months. No adverse trends or recurring conditions are noted regarding events in this reporting criteria.

1st QUARTER FY-18 GROUP 6: CONTAMINATION AND RADIATION CONTROL EVENTS

TREND SNAPSHOT

Contamination/Radiation Events: No reportable events related to contamination and radiation control were reported in 1st Quarter FY-18. The rate of these types of events is trending downward over the past two years. Two non-reportable events related to contamination and radiological controls were documented this quarter.



No contamination/radiological controls events were reported during 1st Quarter FY-18; however, there were two non-reportable events. The non-reportable events are summarized below.

Non-Reportable Events

Leaking Radioactive Sealed Source

CO-2017-2625

A leaking sealed radioactive source was identified in IRC building IF-603 lab B-5 during the semi-annual leak test. The source was labeled as "mixed nuclide alpha source." Contamination levels were approximately 912 dpm/swab alpha. The source has been bagged and controlled. The area around the source and the counter where the source was used were surveyed, with no contamination detected.

What We Can Learn:

Due diligence and routine surveys help to ensure contaminants are not spread outside the desired area.

Fixed Contamination Identified on Legacy Cask Stand

CO-2017-2730

Fixed contamination was unexpectedly identified on a legacy cask stand at MFC. Modifications and paint removal were being performed on the cask stand in preparation for repurposing the stand. Radiation Control was asked to free-release the stand so it could be transported to town for further work. Work had been previously performed on the stand in various shops, including removal of some components. While conducting surveys to support free-release of the stand, Health physics technicians located fixed contamination on one spot of the removed catwalk.

What We Can Learn:

Lessons from this event have already been described in the Lessons Learned section of this report.

ANALYSIS FOR RECURRING EVENTS:

There have been two reportable and six non-reportable events under the radiation and contamination reporting criteria during the past 12 months. Both of the reportable events were related to personnel contamination. Since last quarter, INL Radiological Control management has been actively addressing an increase in non-reportable radiological-control violations. The non-reportable events this quarter show that personnel are diligently surveying items to ensure that they are radiologically clean before they are either used or released from INL. This behavior is crucial to eliminating the number of personnel exposure or contamination events.

1st QUARTER FY-18 GROUP 7: NUCLEAR EXPLOSIVE SAFETY EVENTS

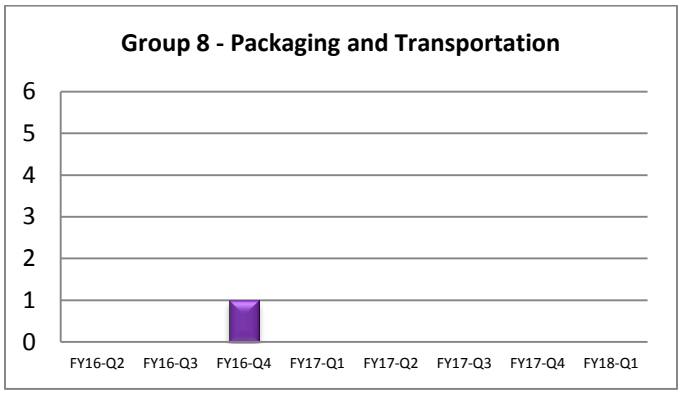
TREND SNAPSHOT

Nuclear Explosive Safety Events: No events related to nuclear explosive safety were reported during 1st Quarter FY-18. From the initiation of the contract for INL in 2005, BEA has never reported an event under this group's reporting criteria.

1st QUARTER FY-18 GROUP 8: PACKAGING AND TRANSPORTATION EVENTS

TREND SNAPSHOT

Packaging and Transportation Events: There were no reportable or non-reportable events related to packaging and transportation (P&T) during 1st Quarter FY-18. The rate of occurrence of P&T issues is trending at zero over the last 12 months.



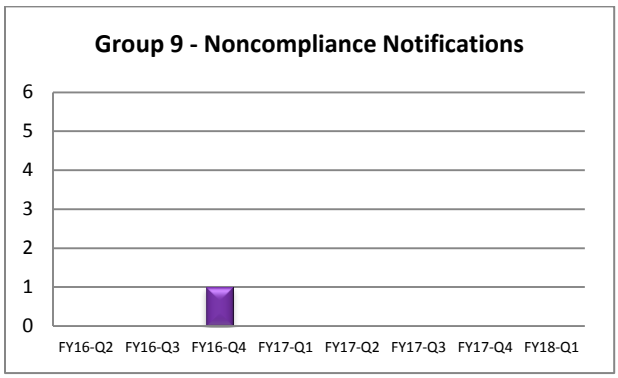
INL rarely experiences reportable events under P&T's reporting criteria. There were no reportable or non-reportable events during the 1st Quarter FY-18.

ANALYSIS FOR RECURRING EVENTS:
INL has not reported any events under this reporting criteria during the last 12 months. There is no indication of an adverse trend or recurring problems associated with P&T activities at INL.

1st QUARTER FY-18 GROUP 9: NONCOMPLIANCE NOTIFICATIONS EVENTS

TREND SNAPSHOT

Noncompliance Notification Events: Noncompliance notification events are reported when INL receives written notification from an outside regulatory agency that the site or an INL facility is considered to be in noncompliance with a schedule or requirement. INL did not receive any noncompliance notifications during the 1st Quarter FY-18. The two-year trend data for these types of events is trending steady near zero.



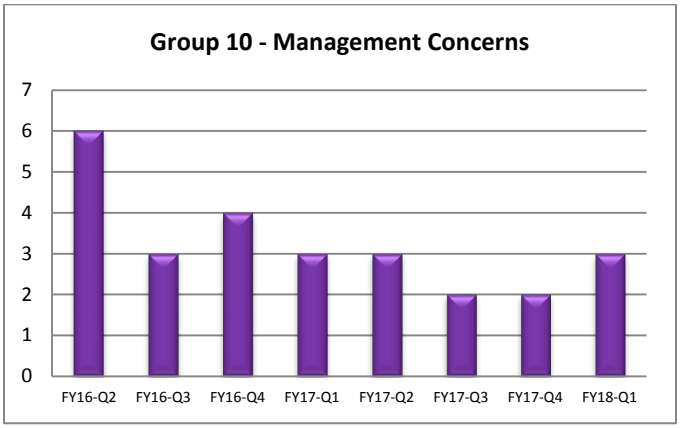
Non-Reportable Events
INL has not reported an event under this criteria during the last twelve months. There were no non-reportable events related to noncompliance notifications reported during 1st Quarter FY-18.

ANALYSIS FOR RECURRING EVENTS
INL has reported one event in these reporting criteria during the last 24 months. There is no indication of an adverse trend or recurring problems associated with noncompliance notification reportable events at INL.

TREND SNAPSHOT

Management Concerns and Issues: INL reported one near-miss and one event that management determined to be of safety significance in this reporting group during 1st Quarter FY-18. The rate of occurrence of reportable management concerns continues to trend downward over the past two years. During the past 12 months, INL has reported 10 events under this group's reporting criteria.

INL has reported 16% of all events in FY-18 under Group 10, Management Concern reporting criteria. The rate of occurrence of events reported under this criteria has been trending downward over the past two years.



The three events reported during 4th Quarter FY-17 are summarized below.

Incorrect U-235 Content Specified in the Advanced Fuel Cycle 3F Data Package

NE-ID--BEA-ATR-2017-0048 (Report Level Informational)
Experiment Engineering was performing a review of Advanced Fuel Cycle (AFC)-3F Removal Traveler, per form RP-4152, "Removal—ATR Experiment Removal Traveler." This review discovered that DP-002, "Fuel Cycle Research and Development AFC-OA Irradiation Experiments in the ATR," contained a U-235 equivalent mass content that is inconsistent with the as-built ECAR-3309, "AFC-3F Fuel As-built Isotopic and Chemical Constituent Report."

The data package incorrectly specifies a value of less than 10 g U-235, and the ECAR correctly specifies a total of approximately 18.6 g U-235 equivalent. This experiment was inserted during Advanced Test Reactor (ATR) Cycles 160A-1, 160B-1, and 162A-1. The install and removal travelers referenced the value from the data package for U-235 content (i.e., less than 10 g). TSR-186, AC-5.7.7.2, Fuel Storage and Handling Requirements, allows experiments with less than 15g of U-235 to be excluded from certain "out of approved storage requirements." However, after discussion with the ATR Canal Coordinator, it was determined that having the incorrect value specified did not impact how the experiment was handled.

ATR Reactor Engineering referenced both the as-built information and the data package for their core model; however, for U-235 gram loading, they used the loading from the as-built ECAR. Therefore, the current loading in the core was accurately modeled.

What We Can Learn:
Attention to detail is crucial when developing paperwork for nuclear reactor experiments. The wrong calculations can negate the results of the tests and cause significant loss of productivity, money, and reputation.

Section of Ducting Falls at IF-685 E-100 Process Development Unit

NE-ID--BEA-STC-2017-0004 (Report Level Informational)
A 15-in.-diameter section of air ducting, weighing 36.8 pounds and measuring 59 in. long, fell from its installed location in the Process Development Unit (PDU) in building IF-685. The ducting connected the process equipment to a bulkhead interface and was discovered on the floor of the PDU on November 7, 2017.

At some point between Friday, November 3, and Tuesday, November 7, the section of ducting became disconnected from the process equipment and fell to the floor. No one was

in the immediate vicinity when the section dislodged, and there was no damage to any equipment located in the facility.

The duct was attached at both ends with original-equipment-manufacturer rubber connectors and band clamps. It appears that the distance between the bulkhead connector and the pellet cooler had increased such that one end of the section became disconnected, causing the opposite end to also become disconnected and allowing the duct section to fall. The section fell approximately 12 feet to the floor below.

Prior to the ducting falling, high winds with sustained wind speeds of greater than 40 miles per hour and wind gusts reaching 58 miles per hour occurred. The metal building, to which the ducting was attached, was buffeted by these high winds for a number of hours. This likely caused the metal skin of the building to expand resulting in the bulkhead connectors moving apart and the ducting falling to the floor.

What We Can Learn:
We all understand how dangerously strong winds can affect travel, but do we think about how those same winds can affect the buildings in which we work? Oftentimes, siding or roofing materials are dislodged due to high winds, but this event shows us that things can also occur inside the building. After exceptionally high-intensity wind events, cautiously enter buildings and inspect the area to ensure nothing has become dislodged or is posing a safety hazard.

Discovery of Exceeded Fissile Material Mass Limit in ZPPR Drum

NE-ID--BEA-ZPPR-2018-0001 (Report Level Informational)
The Zero Power Physics Reactor (ZPPR) facility was recently working on the re-packaging of legacy items stored in the facility storage vault that did not meet required controls for storage and handling per facility procedures. On November 29, 2017, ZPPR facility operations personnel completed the re-packaging of a storage location containing transuranic material. This re-packaging work made the material compliant for storage in the ZPPR vault. The completion of this evolution resulted in the material's being placed into three different storage-location configurations consisting of nested drum configurations (i.e., a drum inside of a drum).

On December 18, 2017, ZPPR personnel were reviewing and preparing paperwork for future work evolutions and found that one of the drums associated with the re-packaging work that occurred in late November had a fissile material mass which exceeded a fissile material mass limit in an INL procedure referenced by the ZPPR facility criticality control list. Exceeding this mass limit did not result in a violation of the facility TSR for criticality safety or create an unsafe condition in the facility. Once this discovery was made by ZPPR operations personnel, the facility management was notified and appropriate levels of BEA management were subsequently notified.

What We Can Learn:
Peer reviews of paperwork and calculations are an effective tool in identifying problems. When possible, have a peer or a group of peers double-check paperwork, especially for important work evolutions.

Other Non-Reportable Events

There were no additional non-reportable events this reporting period.

ANALYSIS FOR RECURRING EVENTS:

During the past 12 months, ten events that did not meet ORPS reporting thresholds were reported as management concerns or were categorized as near-misses to a more significant event. Four events reported as not meeting ORPS reporting thresholds were as follows:

1. Radiological equipment and sealed check sources stolen from vehicle.
2. Inadequate zero energy-check during steam and condensate isolation
3. Incorrect U-235 content specified in the Advanced Fuel Cycle 3F data package
4. Discovery of exceeded fissile material mass limit in ZPPR drum

Six events that were reported as near misses during the past 12 months include the following:

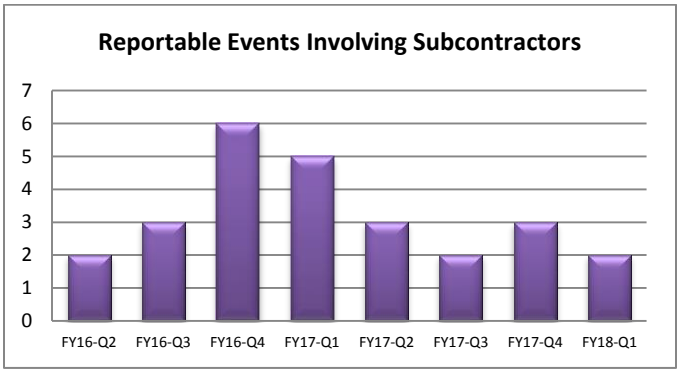
1. LO/TO near miss at the ATR Complex
2. Magnet release of 191-lb plate during lift
3. Failure to install flux monitor wires with Accident Tolerant Fuel Experiments in the Advanced Test Reactor
4. Wireless communication enclosure dislodges from ceiling, striking employee
5. Inadequate Experiment Safety Analysis for Boise State University Experiment
6. Section of ducting falls at IF-685 E-100 Process Development Unit

After reviewing each event, no indication of an adverse trend or recurring problem was found associated with any of the events reported as management concerns or near misses over the past 12 months.

1st QUARTER FY-18 EVENTS INVOLVING SUBCONTRACTORS

TREND SNAPSHOT

Events Involving Subcontractors: Two of the reportable events reported during the 1st Quarter FY-18 involved subcontract employees. The number of reportable occurrences involving subcontractors is trending downward over the past 24 months.



There were 10 ORPS-reportable events involving subcontractors during the past 12 months, including two reported this quarter (network cable repair, and LO/TO on overhead door).

- Subcontracted work issues In ATR Complex cafeteria
- Power cable exposed while core drilling
- Conduit severed during demolition work
- Employee injury: right arm bicep tendon torn
- Serious injury to subcontract employee at ATR Complex Vehicle Monitoring Facility (VMF)
- Unqualified individual performed work under lockout tagout
- Electrical arc in junction box
- Administrative lockout/tagout error
- Network cable repair less-than-adequate work control
- Lockout/tagout noncompliance during work on overhead door

ANALYSIS FOR RECURRING EVENTS:

The events of the past 12 months where subcontractors were involved were reviewed for similarities; no new trends were identified.

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INL Nuclear Safety, Quality, and Performance Management Expectations

Idaho National Laboratory (INL) envisions changing the world's energy future and securing our critical infrastructure. INL's mission is to discover, demonstrate, and secure innovative nuclear energy solutions, other clean energy options, and critical infrastructure. Quality and Performance Management plays a critical role in supporting the INL mission. Our mission is to:

Ensure we, as a Laboratory, know how we are doing and that we are improving our performance.

Own and manage the Laboratory Issues Management System.

Provide high-quality quality assurance program support for research and operations.

Provide effective independent oversight.

"In order to be successful, we must be leaders, we must be competent, and we must be accountable. We must also exhibit the INL values of excellence, integrity, ownership, and teamwork".