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Gentilly-1 Waste Facility Detailed Decommissioning Plan Volume 1 Program Overview - Addendum

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Information Use

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1. Purpose and Scope

This addendum captures the OPEX and Lessons Learned applicable to the Gentilly-1 decommissioning planning and execution. This addendum supplements the Gentilly-1 Waste Facility Detailed Decommissioning Plan Volume 1: Program Overview [1] and will be included in its next revision.

2. Operational Experience and Lessons Learned

The OPEX and Lessons Learned are gathered, documented, and shared [2] among decommissioning staff and workers during routine 'Plan of the Week' meetings, and Pre-Job Briefings prior to non-routine work. Any unplanned events that may occur during the decommissioning work activities, radiological or otherwise, will be reported to the line management. The line management will assess the events, categorize them according to their significance and consequences, notify internal and external authorities (such as the CNSC) as required, investigate the root cause, devise corrective actions, and ensure their implementation to prevent recurrence. OPEX and Lessons Learned are also gathered and documented at the completion of projects for continuous improvement as part of the IWC process [3].

Table 1 presents a summary of selected OPEX, ImpActs, and Lessons Learned (internal and external) from different projects.

Table 1: OPEX, ImpActs, and Lessons Learned

Event Date	OPEX/ImpAct/Report Number	Title and Description
2002/06/19	PJL-02-020	**Lessons Learned from Building 220 Unplanned Events** Radiation monitoring equipment must be selected appropriately to monitor potentially changing conditions in the workspace during work and again following completion of tasks in the "undressing" phase of the work. Managers and supervisory personnel should be actively involved in planning, reviewing, and approving the work. This means approving a properly documented plan, ensuring all preparations are complete, and ensuring that all work team members have been formally and thoroughly briefed before the work permit is issued.
2002/08/07	GCMF-00180-725-000	**Minutes of Meeting, B232 Decommissioning/Dismantling** The following decommissioning readiness deficiencies were noted: • Work plan received on the day work was scheduled to begin. • Regulatory approvals obtained on a tight schedule. • As-built drawings were not identified in the work plan as a requirement to complete.
2004 May	IAEA-TECDOC-1394	**Planning, Managing and Organizing the Decommissioning of Nuclear Facilities –Lessons Learned** • An evaluation of airborne contamination potential during D&D activities should be performed to assess the need for respiratory protection. If respiratory protection equipment is used, a formal training and fit test programme should be established and documented. • Job safety analyses should be performed and documented to support implementation procedures. The analysis should contain a description of the work hazards expected to be present and protective measures for risk reduction. An accident analysis should be conducted to identify potential accidents during the D&D process, and related response measures should be defined and incorporated into the D&D plan. • An evaluation of airborne contamination potential during D&D activities should be performed to assess the need for respiratory protection. If respiratory protection equipment is used, a formal training and fit test programme should be established and documented. • A pre-decommissioning radiological survey should be performed to define the radiation source terms with respect to isotopic composition, physical status and chemical

Event Date	OPEX/ImpAct/Report Number	Title and Description
		composition, and radiation levels. A radioactive material inventory should be evaluated and used to determine disposal requirements and estimate occupational radiation exposures. • Maintenance, surveillance, and calibration (if applicable) of safety-related facility systems should be maintained throughout the D&D process. • Limits for release of contaminated materials for unrestricted use should be established consistent with regulations in place. • A fire protection surveillance program, including inspection and testing of fire detection systems, fire suppression systems, and firefighting equipment, should be maintained during the D&D process. • D&D activities will be severely curtailed if adequate waste management provisions are not available at the appropriate time. • There is a need to avoid the degradation of the perception of risk and to ensure that the perception of workers and the management of this risk is not underestimated. • The US Department of Energy conducts a readiness review before Phase 2 (decommissioning operations) is commenced. A successful Readiness Review will result in the conclusion that each item in the project plan has been completed to the extent required for the start of the physical work on the project.
2004/07/15	RL-PHMC-GENERAL-2004-0005	**Type A Accident Investigation Following Fatal Fall from Ladder** At the Hanford Site, a non-government contract worker (i.e. visiting worker) assigned to prepare a mobile office for removal from the site was found lying motionless at the bottom of a ladder. The worker appeared to have fallen from the ladder; however, no one witnessed the accident. The worker suffered a serious head injury, and resuscitation efforts at a local hospital were unsuccessful. The Hanford Site Manager appointed a Type A Accident Investigation Board to analyze events leading to the fatality and to identify probable causal factors.
2004/08/30	RFO-KHLL371OPS 2004-0022	**Energized Wiring Cut During Demolition** At the Rocky Flats Environmental Technology Site, a journeyman electrician cut an electrical conduit containing energized 480-volt wiring with a cordless reciprocating saw, resulting in an electrical arc and a tripped circuit breaker. The conduit had been incorrectly marked for removal as part of an electrical strip-out evolution for building demolition. The electrician failed to perform a

Event Date	OPEX/ImpAct/Report Number	Title and Description
		zero-energy verification as required before cutting. There were no injuries in this near-miss incident.
2007/08/14	B464-01910-260-000-0003	**B464 Decommissioning Project Lessons Learned** • There was some misunderstanding and miscommunication with the interface between Radiation Protection and Waste Management with respect to the WMP, the final survey and the verification check. • Preparation for the demolition work commenced prior to establishing control access and boundaries. CNL personnel not required for the project were entering the building. • When services were capped, the depth coordinate was not captured before being backfilled.
2009 March – 2012 March	End State Decommissioning Report, WLDP-23514-ESDR-001	**Tyvek® suits are not impervious to moisture** Radiological contamination can wick through aTyvek® suit when combined with moisture and contaminated CA2 whites and possibly skin. This was found when a Decontamination Operator was kneeling during work and was sweating on his knees.
2009/09/29	B204-514000-REPT-001	**Building 204 Lessons Learned Report** • In addition to improvements already implemented, “best practices” such as source term reduction (e.g. decontamination) and hazard reduction (e.g. application of fixatives to contaminated surfaces, use of dismantling methods to minimize re-suspension of contamination) should be implemented whenever feasible. • The assignment of a Field Engineer(s) should be considered for decommissioning projects that are anticipated to require engineering support. The Field Engineering responsibilities would include, but are not limited to, reviewing engineering documents, surveillance of work execution and supplied materials, and reviewing and approving Field Change Requests (FCRs). • Decommissioning readiness reviews should be performed in accordance with pre-defined criteria, and the results of the review should be recorded. A decommissioning readiness checklist should be prepared. The checklist should include a review of actions taken to address past performance issues, ensuring that past actions are still being implemented. • Facilities Decommissioning should determine if improvements can be made in the radiation protection equipment provided to workers, namely in improving conditions for preventing

Event Date	OPEX/ImpAct/Report Number	Title and Description
		industrial accidents (e.g., better field of vision, removal of tripping hazards, improved communication). • Waste class assignments of "Likely Clean" should apply historical information in a conservative manner and be substantiated by measurement processes with Minimum Detectable Activity Levels sufficient below acceptance criteria, with due consideration for uncertainty and limitations (e.g., background levels). • Waste disposition decisions should be made early in the decommissioning process. Changes to processing versus storage costs can be significant and have a substantial impact on both cost and schedule. When external waste management services are used, contracts should be established in advance of dismantling/demolition activities. Waste handling details (e.g., extent of waste segregation) of the contract should take into consideration to potential work site limitations.
2009/10/27	D_WM-09-02384	**Work Stopped on Warm Cells Decommissioning Project due to Safety Concern** Millwrights raised a concern regarding the replacement/removal of the roof panels of Cells 15 and 16. This issue was raised at their Trades safety meeting on the morning of March 11th. The existing fall protection railings on top of the warm cells were causing difficulty due to the clearance between them and the roof panels. Moving the roof panels through this tight area was very difficult and exposed the workers to some unnecessary tasks. The existing cell railings also leftlittle room for workers to stand on top of the warm cells. There are also radiological risksassociated with this task.
2010/12/09	DOE OPEX OESummary 2011-08, Article 2	**Avoid Lifting Incidents: Use a Crane Rated for Load** Mismatch between the capacity of the equipment being used in a lift and the weight of the object being lifted. To ensure the safety of workers, assumptions should never be made about the capability of lifting equipment. Also, the work scopes and work control documents must be complete to ensure that all hazards have been identified and controlled. On 2010 December 9, at the Lawrence Livermore National Laboratory, two workers threaded a chain through the lifting arm anchor holes of a 2,600-pound lead shielding cover and attempted to lift it with a portable shop crane that was undersized for the weight of the shielding. The workers had placed approximately 18 of the 25-pound lead bricks at the rear of the hoist to provide stability and counterbalance. However, once they began the lift, they realized that they could not reach the desired height due to the weight of the cover and the configuration of the lifting

Event Date	OPEX/ImpAct/Report Number	Title and Description
		operation. When the cover was approximately 1.5 ft off the ground, a technician entered the area and instructed the workers to lower the load due to safety concerns. After work was stopped, they determined that the crane was not suitable for the lift. The metal plate on the unit, which lists the model number and capacity, was unreadable, but it was clear that the crane was not rated for the 2,600-pound lead shielding cover and that using an unrated chain threaded through the lifting arm anchor holes instead of a spreader bar was not an appropriate lift configuration. The Management identified this event as a near miss and initiated a management review to determine the cause of the event. Following this event, the shop crane was tagged out of service to ensure it would not be used for any lifting activities in the future.
2011/02/28	PMLL-2011-SPRU-H2-0001	**Over-Reliance on 'Fixatives' for Contamination Control** An over reliance on the application and effectiveness of fixatives to control the spread of contamination during demolition led to the uncontrolled release of radioactive contaminants to areas outside of the Separations ProcessResearch Unit at Niskayuna, New York.
2011/03/01	PMLL-2011-SPRUARRA-H2-0003	**Ineffective Work Control Practices** The removal and size reduction of contaminated equipment during demolition activities, which led to a contamination event outside the boundaries of the Separations Process Research Unit (SPRU) project, was partially due to not following work control processes that could have prevented the occurrence. The direct cause of the accident was the open-air demolition of the evaporator systems from thebuilding. They also identified two root causes that could have prevented the spread of contamination if they had been controlled. They were: 1) The failure to understand, characterizeand control the radiological hazard; and 2) The failure to implement work control processes thatensured facility conditions supported proceeding with the work.

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2011 September	Technical Report, 1023456	**Power Reactor Decommissioning Experience** • Characterization and the ensuing D&D work planning need to be performed on a continuous basis throughout a decommissioning project. • The use of specialty off-site facilities for decontamination and free-release of materials to controlled landfills, such as those in Tennessee, has allowed waste materials to be removed from project sites much more rapidly, thereby shortening schedules and reducing project labour.
2011/11/24	WLDP-31030-ESDR-001	**End-State Decommissioning Report: Buildings 504, 509 and 526** More detailed field notes should be taken to make the end-state report easier to write.
2011/11/29	ORPS Report EM-BHSO-BNL-BNL-2011-0032	**Fall from Scissor Lift at Brookhaven National Laboratory Results in Serious Injury** At Brookhaven National Laboratory (BNL), a torch operator working from a mobile scaffold to cut away sectors of the Brookhaven Graphite Research Reactor fell 16 feet when the lift guardrail gave way as he leaned against it.
2012 March	WLDP-21417-ESDR-001	**End-State Decommissioning Report (ESDR): WL Shielded Facilities (SF) Work Plan 6 – Cells 14-18** • A wetting agent proved to be quite effective in preventing the dispersion of airborne and the spread of surface contamination. The surface, after application of the wetting agent, remained tacky (due to its affinity for water). This helped to suppress the re-suspension of surface radioactivity during cutting. The sheet metal nibbler had no issues cutting through the CC wet coating system on the inside of the stainless-steel duct. • The execution of some work involved the use of a clear, temporary, ventilated enclosure. The use of white boards inside and outside of the enclosure was demonstrated to provide an effective means of communication. • Prior to disconnecting systems, components were decontaminated as much as feasible, and a surface fixative was applied using airless paint sprayers. This proved effective in sealing any loose contamination and allowed the system to be disconnected without the concern for possible re-suspension of dispersion from contaminated surfaces.

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2012/12/04	ENG-12-9534 / OPEXIB-12-64	**Confined Space Entry:** During the pre-job briefing for a task to be completed in a confined space, it was discovered that the workers involved were unaware of the Confined Space requirements for the facility where they were working. Neither the facility specific requirements nor the initial hazard assessment of the confined space was included in the work package. <u>Actual or Potential Consequences:</u> • Workers would have proceeded to work without the full knowledge of the hazards, precautions, and safe work practices for the area where the work tasks were to be performed. • Changing conditions in the facility could affect the hazards in the work area, and this is described in the Information to Staff (ITS), which has identified confined work spaces with known hazards. <u>Lessons Learned:</u> • When planning or performing work activities, it is incumbent on those planning for and leading the work that the people assigned to perform the work are adequately trained and are familiar with facility and confined space specific requirements. The importance of performing a comprehensive PJB to ascertain whether or not the job should proceed with the assigned staff.
2013/03/27	WLDP-23514-ESDR-001	**End-State Decommissioning Report: Building 300 Work Plan 4 –North Extension Active Drain Lines, Pneumatic Transfer Lines and Thorium-Nitric Acid Solution Storage Tank Removal** • Expanding foam was used to stabilize contamination within steel low level liquid waste drain lines prior to cutting and removal from a crawlspace in B300. A small hole was drilled into the top of the pipe, expanding foam was injected to fill the void, and the pipe was cut using a band saw. When cutting required using a reciprocating saw, shaving cream was first applied around the pipe at the cut line, which considerably reduced the dispersion of cutting debris. These methods proved effective in the safe and efficient removal of steel piping, while minimizing and controlling contamination. • Tyvek® suits are not impervious to moisture. Radiological contamination can wick through a Tyvek® suit when combined with moisture and contaminate CA2 whites and possibly skin.

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		This was found when a Decontamination Operator was kneeling during work and was sweating on the knees.
2013/11/25	PMLL-2013-WVDP-VF-02	**Dismantling the Vitrification System at the West Valley Demonstration (WVD) Project** The dismantling of the WVD Project's Vitrification System, located within the Vitrification Facility (VF) posed a range of technical challenges, including High Radioactive Contamination, HighRadiation levels, and limited in-cell infrastructure. Through the use of some basic techniques suchas designing the facility to be dismantled remotely, thoroughly familiarizing the operators withcritical equipment before beginning work and performing the work in well thought out order, the scope of work was performed successfully; in spite of unanticipated failures that includedderailment of a cart in the transfer tunnel that was transporting a major system component out of the Vitrification Cell.
2015/01/16	WLDP-23515-ESDR-001	**WL Bldg 300 Work Plan #5 –Active Ventilation Shutdown, Removal and Penthouse Cleanup of Highbay and Stages 1, 4 and 7** • Personnel are to apply Instacote CC Wet fixative carefully on duct surfaces with lose contamination to prevent over-application. If over-applied the Instacote CC Wet fixative will pool in low areas of the ductwork and leak onto floor. Decontamination workers used mop heads to soak up the excess CC Wet.
2015/05/07	WLDP-23512-ESDR-001	**End-State Decommissioning Report: Building 300 Core Area Shutdown & Decontamination** • Conducting decommissioning activities in a partially operational facility, which is partially being reconfigured for reuse, is challenging. Ongoing effective communication must be maintained at all times with building operation personnel. Decommissioning of facilities must be coordinated to minimize impact with on-going facility operations and maintenance. • The slow removal from the building and disposition of water generated by the WP created an ongoing bottleneck to workflow. The established staging areas were inadequate.
2015/11/13	D&WM-15-8868	**Gentilly-1 Turbine Building Advanced Decommissioning Potential Issue** Physical barriers (such as fire separation) may become compromised during decommissioning asequipment (such as pipe work) is removed. These may require to be reinstated duringdecommissioning operations.

Event Date	OPEX/ImpAct/Report Number	Title and Description
2016 March –2017 April	WLDP-27400-ESDR-001	**Decommissioning and Demolition of the Decontamination Centre (B411)** Structures and systems with residual contamination were uniquely identified for removal, segregation, and packaging as radioactive waste. The PBS fixative was a dark blue and very distinguishable. However, there were occasions where there wasoverspray onto clean surfaces, and it was unclear to the excavator operator on whether surfaceswere contaminated and needed segregation.
2017/05/19	WLDP-23519-ESDR-001	**WL Bldg. 300 Work Package #9 –Segregation and Demolition of B300 Stages 4 and 7** • The migration of water into the excavation from rainwater, spring runoff, and a firewater line break in Stage 1 of B300 was an ongoing issue as the contractor removed the sump earlier than anticipated by the project. Leaving sump pump and storm drains in place as long as possible would have reduced water management issues. • Ice in crawlspace piping, from residual water that froze due to the contractor's decision of not retaining heat in the crawlspace, made it difficult to cut and drain the pipes. CNL had isolated these pipes prior to the contractor coming on site; however, efforts to ensure residual water is drained throughout the piping systems must be made during isolation. • System components that require segregation during demolition need to be better identified. The labelling of "likely clean" fan ductwork by the contractor that was planned to undergo additional clearance surveys caused confusion and delays during removal. Better identification using highly visible and specified coloured paint for non-cleared material to be segregated would be value added. • Physical demolition was planned for winter except for days with high winds when the potential for dust particle migration and wind-chill impacts to personnel were increased. Both winter and summer have pros and cons; however, carry-over of demolition activities from winter into spring introduces changing conditions that are challenging such as water management and migratory bird nesting season.

Event Date	OPEX/ImpAct/Report Number	Title and Description
2017/08/04	D&WM-17-3598	**Heavy Equipment Drop Off at PGWMF without Spotter** On the morning August 04, 2017, Rental Centre (subcontractor for Lakeland) dropped off heavy equipment for removal of the FRP (fiberglass) vent stack for the HCl storage tank at the old water treatment building on lakeshore Road by the old water treatment building. The driver had no spotter while he was doing the drop off. The Pre-Job Brief should be updated to include requirements of spotters when vehicles are involved in contractual work, whether it be a regular delivery of goods, maintenance work or repair work. This constant reminder will improve both the oversight of the work order and the safety of all workers in and around the area of operational vehicles.
2018/01/29	US DOE, OE Summary 2018-01	**The Importance of Quality Assurance during Work Planning for Preventing Accidents** Numerous occurrences have been reported within DOE in the past several years that highlight the importance of QA during work planning for managing risks associated with all work processes. Below is an example that illustrates the failures that occurred when work was not adequately planned by applying QA criteria during the work planning process. • Lab equipment disposal occurs before final approval process - On January 31, 2017, a small, out-of-service canopy hood was removed and placed in a metal recycle bin prior to completing the National Renewable Energy Laboratory's (NREL) internal decommissioning and release process. The lab where it originated had previously been used for radiological work, which included small quantities of radioisotopes, such as carbon-14 and tritium. A parent maintenance work order was issued to remove the canopy hood from the lab space. Hold points were established to confirm that release criteria were met, and disposition procedures were followed. Written instructions, including the hold points for the removal process, were included in a subsequent "child" work order (CWO). The CWO was attached to the "parent" maintenance WO (PWO). However, the technician performing the task only followed the instructions of the PWO and removed the canopy without completing NREL's internal decommissioning and release process. The QA during work planning is a crucial component to ensure safe work performance. The causes identified include the following: • Job scoping did not identify special circumstances and/or conditions. • Inadequate work package preparation.

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		• Appropriate level of in-task supervision not determined prior to task. • Risks/consequences associated with change not adequately reviewed/assessed. • System interactions not considered. • Ambiguous instructions/requirements. • Tasks and individual accountability not made clear to worker.
2018/04/05	OPEX 10-0276	**Use of Temporary Shielding to Protect Workers** The asbestos abatement and re-insulation projects at the Idaho National Laboratory's Advanced Test Reactor (ATR) illustrate how strategic use of temporary shielding can significantly reduce radiation exposure during high-dose work. The experiment loop cubicles presented elevated radiation levels, and initial collective dose estimates ranged from 10,000 to 24,000 mrem due to the labor-intensive nature of asbestos removal and insulation replacement. Recognizing this challenge early, the project team incorporated shielding solutions into the planning phase to minimize time spent in high-dose areas and maintain ALARA principles. Temporary shielding was deployed to protect workers during prolonged tasks, effectively reducing dose rates at the work face and enabling safer, more efficient execution. Combined with optimized work sequencing and other dose-reduction strategies, these measures allowed the project to finish ahead of schedule with a cumulative dose of 8,509 mrem, well below original estimates. This outcome demonstrates that integrating shielding into radiological work planning is a critical best practice for dose management, particularly in complex maintenance or decommissioning activities where extended exposure is unavoidable.
2018/06/30	D&WM-19-0117	**ECIS Bunker Decommissioning/Demolition** Contamination was found in 10" ECIS pipe, which was supposed to be clean. The pipe was rechecked at multiple locations and contamination was found to have extended farther than initially anticipated. The consequences were several delays to ECIS Bunker Demolition project, and additional approvals were required for the contaminated piping to be removed. Project execution timeline was not changed. The recommendations for future work included re-assessing project schedule baseline when something major is found (e.g. contamination on presumably clean equipment). Do not assume

Event Date	OPEX/ImpAct/Report Number	Title and Description
		piping near the reactor building is clean, even if it is supposed to be clean. Every single pipe should have been checked.
2018/11/08	OPEX-18-1070-002	**Lessons from In-Situ Decommissioning** While In-Situ Decommissioning (ISD) has been successfully applied at US Department of Energy (DEO) sites such as Hanford, Idaho, and Savannah River, offering cost and safety benefits by entombing below-grade structures with grout, its applicability depends on strict site-specific criteria. For facilities where permanent entombment is not feasible or does not meet regulatory or stakeholder requirements, segmentation and size reduction remain the preferred approach. This method enables complete removal of contaminated materials, supports waste characterization for licensed disposal, and provides flexibility for future site reuse. Key lessons emphasize the importance of early engineering studies, detailed structural characterization, and robust planning for radiological safety and logistics. Unlike ISD, segmentation introduces challenges in handling, cutting, and packaging highly activated components, requiring specialized tooling and remote technologies to minimize worker exposure. Effective contracting strategies, clear technical specifications, and strong interface management are critical to avoid scope gaps and ensure compliance. Additionally, attention to water management, ventilation, and contamination control during dismantlement operations is essential. Projects have shown that integrating advanced visualization tools, remote access systems, and precise material handling plans significantly improves efficiency and safety. Ultimately, segmentation and size reduction demand a higher degree of operational complexity than ISD but remain a vital option where full removal aligns with regulatory, environmental, and stakeholder objectives.
2018/12/14	OPEX-19-0336	**Falling Tool Results in an Increased Risk to Personnel Safety** A Contractor supporting an Emergency Power Generator (EPG) Demolition Project was removing rectifier panels using a tool (prybar). When the Contractor went to remove a panel, they set the tool down by leaning it up against the wall, and the tool inadvertently slipped through a penetration in the concrete

Event Date	OPEX/ImpAct/Report Number	Title and Description
2019/02/14	D&WM-19-0505	**ECIS Bunker - Contaminated Pipe Removal** During the execution of work in the ECIS bunker, a site wide electrical outage occurred. Lights went out and as a consequence, workers successfully performed a safe back out. RP staff helped with undressing outside the ECIS bunker, and no contamination or injuries occurred. All workers were aware of proper back out procedure during power outages as those details were discussed during project roll-out/pre-job brief. Work was delayed a few hours until investigation was completed. Portable generators were installed to power the essential services in the bunker (i.e. lights, iCAMs and HEPA ventilation). The recommendations for future work included establishing a portable power supply system before decommissioning/demolition projects start-up. The portable system should have enough capacity to power multiple power tools, exhaust systems, and vacuums at once.
2019/09/30	WLDP-27400-ESDR-001	**Decommissioning and Demolition of the Decontamination Centre (Building 411)** • A detailed evaluation was performed for the selection of a surface fixative to lock in contamination and prevent dispersion during open-air demolition activities. The polymeric barrier system (PBS) latex fixative was the recommended and preferred product for application. The PBS fixative was successfully applied to contaminated concrete surfaces and the exterior and interior of contaminated tank surfaces. It was noted that surfaces needed to be cleaned of grease or dust for proper adherence and locking onto surfaces. • Structures and systems with residual contamination were uniquely identified for removal, segregation, and packaging as radioactive waste. The PBS fixative was dark blue and very distinguishable. However, there were occasions where there was overspray on clean surfaces and because of this it was unclear to the excavator operator on whether surfaces were contaminated and required segregation. • PacTec bag scales set up outdoors did not have all weather resistant panels (electrical) and connections. The project encountered some minor time delay due to having to change panels and seal boxes. Any electrical equipment set-up outdoors must have all weather resistant panels and connections. • An inadequate supply of tarps was available for PacTec bag storage and contaminated material lay down areas. The project encountered delays while procuring additional tarps. The project switched to rolls of thick polyethylene sheeting instead of tarps for a short-term solution.

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		• IP#1 bags tore easily on the top flaps and corners due to weight stress from the loading device. This caused delays while material had to be re-bagged and increased the risk of spreading contamination. Sharp edges on the loading device were filed and deburred, and tape was acquired to patch small holes. Extra care was taken when loading bags and removing bags from the loading device. • Bar code numbers used for all contaminated waste were duplicated during the demolition. This was caused by different personnel issuing bar code stickers that were unfamiliar with the printing system. This caused some project delays and re-work for RP personnel in preparing waste documentation and labelling bags. An adequate supply of bar codes and paperwork are issued for the duration of the project; personnel must be adequately trained and familiar with the processes and systems they are working with.
2020 July	LL-NL-2020-03	**Best Practices in Project Management: Successful clean out project of over 4,000 ft2 of floor space of a legacy accelerator facility** The Advanced Photo Source Upgrade (APSU) project involves replacing the existing electron storage ring at the APS in Building 375 at Argonne National Laboratory (ANL). This multifaceted project is divided into two phases, phase I) the beamline and Neutron Scattering Target (NST) systems decommissioning and phase II) target monolith, proton transport tunnel decommissioning. Phase I began in November 2018 with planning and the completion of appropriate work control documents and successfully completing an independent project review. The field activities began in March of 2019. Phase I decommissioning of the Building 375 NST facility included dismantling and removal of the research beamlines cryogenic cooling, exhaust ventilation, electrical service feeder and branch circuits, chilled water systems, and other components not directly associated with the neutron scattering target monolith and proton transport tunnel. The graded implementation plan supports efficient removal of specific excess equipment, materials and waste; activities will include radiological characterization, recycling of characterized excess metal and disposal of legacy low level and mixed waste items, as appropriate. The physical structure of Building 375, after decommissioning, will remain in place for future use. The following describes the examples of each core value at ANL as the project moved forward.

Event Date	OPEX/ImpAct/Report Number	Title and Description
		1. Impact - Operations team members were extremely receptive to new ideas, suggestions and concerns presented by other members, and because of this attitude the project saw very little break downs in communication. In fact, team members felt comfortable, open and willing to communicate. 2. Safety - The project included termination of all electrical lines, compressed air, steam, nitrogen, helium, water and other utilities that supported equipment operation. The team conducted zero energy verification to ensure positive control for hazardous energy sources. The team also conducted verification of stored energy on any capacitors present. While performing these tasks, the Qualified Electrical Worker/foreman provided the team members electrical safety work tips and reminders. Workers were reminded to pull the wiring smoothly to prevent long term shoulder and back injuries from repetitive movements. Having someone watch the workers pull wires increased safety and prevented major safety incidents. Team members were encouraged to watch over one another to prevent injuries with this project. Everyone involved helped to identify safety issues, and employees were empowered to help with any identified safety concern. 3. Respect and Integrity - Project team managers gave the team milestones that were challenging. When obstacles occurred, team managers offered recommendations and great advice; not once did a project team manager say 'you will do it this way', instead the manager respectfully allowed the empowered team leader to solve the problem and complete the task in a safe manner. 4. Teamwork - The hierarchy and organizational structure of the workers in the project was clearly defined. Each work unit functioned with a project lead with no confusion regarding job roles. Project managers provided leadership and guidance, but led with a spirit of collaboration and teamwork while maintaining a command-and-control structure that worked well.

Event Date	OPEX/ImpAct/Report Number	Title and Description
2022/09/06	ERM-22-2640	**Whiteshell Laboratories - Abandoned Waste in Tip Bins** A site wide inspection found twelve tip bins with varying volumes of waste not dispositioned appropriately. Tip bins were found uncovered outdoors; as a result, most had accumulated significant volumes of precipitation as well. From a visual inspection it is obvious some containers and waste have been exposed to the elements for years. Many have not been segregated. It is known that two such bins, west of Building 412, had evidence of waste dumping prior to being moved outdoors (speakers, electrical ballasts, pop cans, wood, cardboard) when the waste generator was advised to segregate and cover the bins. Abandoned waste is harmful to the environment, an unnecessary cost to taxpayers, and sends a message that this practice is tolerated. It is unknown whether radiological surveys have been completed because historical markings on the bins (colored tape) are not removed before reuse. If completed, the integrity of any radiological clearance surveys is compromised from lack of access control. In addition to the waste, there is now wastewater in the containers that needs to be sampled forradiological and non-radiological contaminants and dispositioned appropriately.
2022/12/13	HSSE-22-3843 (OPEX-23-0044)	**Hot Metal Shavings Cause Protech Suit Failure** Work was being performed on the National Research Experimental (NRX) Storage Block Active Ventilation System in preparation for removal. A Millwright was drilling into active ductwork at various locations inside a TVE. A plastic smell was noticed and the Millwright realized the hot metal shavings caused by the drilling were sticking to their Protech suit. A safe back out was performed and Supervision was notified. Health Physicist was contacted for further direction regarding PPE&C outlined in the RWP. The Health Physicist directed staff to use fire rated Tyvek suits. The RWP was revised, approved, and work was continued.

Event Date	OPEX/ImpAct/Report Number	Title and Description
2023/10/31	C-PROJ-23-3619/OPEX-24-0159	**Near Miss While Hoisting Lock Blocks at ANMRC** A team of workers, including the CBS concrete crew and Dulepka Crane's employees, were engaged in the process of moving lock blocks within the mass excavation area of the ANMRC site using a mobile crane & block lifting attachment. The crew had positioned the attachment onto the concrete block and then began the hoisting operations in an approved blind lifting configuration. The concrete block had become stuck in the surrounding Controlled Low-Strength Materials (CLSM). While the signalman was in the process of retrieving a pry bar to dislodge the block, the crane operator continued to apply tension. This led to the unexpected and sudden dislodging of the concrete lock block, which popped up approximately 2 feet before the crane operator regained control of the load. <u>Causes:</u> • The signalman did not communicate that the block was stuck with the crane operator and did not direct the operator to relieve tension from the crane. • The crane operator did not inform the signalman that increased force was applied compared to the previous blocks. • Unidentified hazard present - It was not identified that the block could get stuck. <u>Lessons Learned:</u> • Stop and Pause: When faced with unexpected circumstances like a stuck lock block, take a moment to pause, ensure the work area is in a safe state and determine the best course of action before proceeding. • Effective Communication: In this case, the signalman could have stopped the lift to communicate directly with the crane operator. The crane operator could then have relieved lifting pressure to eliminate the stored energy hazard. Establishing a clear line of communication between the Signalman and the crane operator may have prevented this near miss event. • Identify the Hazards: It is important to identify and plan appropriately for hazards. This event revealed a stored energy hazard which resulted in the work plan being revised to include prying blocks before lifting.

Event Date	OPEX/ImpAct/Report Number	Title and Description
2024/02/07	WER PAR 24-0219	**Forsmark Unsafe Cutting Operations** During dismantling activities at Forsmark Nuclear Power Plant in Sweden, seven neutron flux detector houses (NFDHs) fell uncontrolled into containment while cutting was performed inside Unit 1's reactor pressure vessel (RPV). The incident occurred because the contractor applied a generic dismantling method used for three other RPVs, without accounting for Unit 1's unique design, specifically a 1994 modification not reflected in planning documents. The cutting was done below a welded sleeve, releasing the inner tubes unexpectedly, and the change in conditions was not properly risk-assessed. The event revealed critical gaps in planning, communication, and safety culture. The contractor did not notify the license holder of the deviation, nor did they perform a risk analysis when changing the cutting method. A questioning attitude was lacking, and differences in design were not challenged or verified. This led to increased risks to personnel, equipment, and contamination control, including a near-miss involving lighting failure and potential damage to the control rod replacement machine. Corrective actions included halting work, conducting an investigation, and updating risk assessments to reflect Unit 1's specific conditions. The key lessons learned stress the importance of tailoring dismantling plans to each unit's design, ensuring thorough review of historical modifications, and fostering a safety culture that prioritizes conservative decision-making and proactive risk identification. Future work must ensure that work orders and methods are unit-specific and validated to prevent recurrence.
2024/06/05	IRIS#:609207	**Neutron Radiation at Bruce Power** Bruce Power's Life-Extension Program, including the Major Component Replacement (MCR) Project, involves complex refurbishment of CANDU reactors. During the removal series, fuel channel components are placed in shielded waste containers (RWCs). Historically, neutron radiation was not considered a hazard in this waste stream, based on past operating experience and supporting documentation. However, neutron dose was unexpectedly detected during an IAEA inspection at another facility, prompting Bruce Power to reassess its own waste handling practices. Subsequent surveys confirmed neutron hazards in RWCs from MCR6 and MCR3, revealing a gap in the Radiation Protection (RP) Program. The program lacked guidance on neutron radiation for MCR waste and did not require verification of radiological assumptions during planning. This highlights the importance of validating radiological hazard assumptions through field surveys, especially

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		when dealing with novel or evolving waste streams. The neutron source was traced to spontaneous fission of Cf-252, likely caused by activation of uranium impurities in reactor materials. This finding underscores the need to consider trace material activation in waste characterization and hazard assessment. A key lesson learned is the necessity of updating RP guidance to include neutron hazards and ensuring planning processes incorporate verification steps to prevent unexpected exposures, such as the 58 mrem dose recorded during MCR3.
2024/06/13	OPEX-24-1536	**Delivery of Excavator Bucket – Unexpected Movement When Repositioning for Attaching to Excavator** On June 13, 2024, a scheduled delivery of an excavator landscaping bucket to the contractor's worksite was performed. The bucket was delivered on a skid/pallet and was banded with metal banding to that pallet. While still banded to the pallet, the pallet and bucket were unloaded from the delivery vehicle and placed on the ground. The metal banding was removed to allow for the bucket to be connected to the excavator. The orientation of the bucket on the pallet prevented connection to the excavator. It was determined that the bucket would require repositioning on the pallet to allow for connection. Being a landscaping bucket, it had a hydraulic “wrist” that allowed for articulation of the bucket when connected to the excavator. A strap was installed around the wrist of the bucket, and the strap was then placed over a pallet fork tine on a skid steer to allow for lifting/repositioning. As the skid steer lifted the bucket, the strap slid on the fork tine towards the rear of the time. This caused the landscaping bucket to shift towards the skid steer. A portion of the landscaping bucket made contact with the skid steer cab door, causing the glass of the cab door to be damaged. There were no personnel in the bucket area other than the skid steer operator, who was using all applicable PPE and skid steer safetymechanisms. There were no injuries and no damage to any items other than the glass of the skid steer cab door.

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2025/01/13	SAND2024-155950 Lesson Share, Sandia National Laboratories (SNL)	**Full Body Harness Fit and Adjustment** A full body harness may require occasional adjustment to be worn correctly. Improper harness fit could result in greater injury during a fall arrest event. <u>Observation:</u> • A worker was returning to the ground for a work break while wearing a loosely fitted full body harness as part of their personal fall arrest system. <u>Possible worker impacts from a loose-fitted or improperly fitted harness:</u> • Slip out of the harness from fall arrest forces • Suffer severe bodily injury during a fall arrest due to shifting straps • Strike a lower level due to the loose harness lengthening more than the planned required fall clearance <u>What was Learned?</u> • Full body harnesses are engineered by size to distribute fall arrest forces into the body to minimize injury. ▪ Select the proper size harness according to the manufacturer's instructions. ▪ After the harness pre-use inspection, don the harness and adjust the straps per the manufacturer’s written instructions for a correct fit. ▪ Do not overtighten harness straps. They should be snug without obstructing blood flow. • During the course of work, check the harness fit occasionally and adjust as necessary. ▪ The buckle or adjuster type may affect the frequency of adjustment. ▪ If working actively or wearing a harness for a long time, the straps may loosen and require adjustment. • Alert your coworker if you notice their harness needs an adjustment.

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2025/08/20	2025-LL-0063	**Unsecured Ladder Causes Concussion (SRMC)** During repairs to a radiological containment hut, an operator propped a 10-foot A-frame ladder against an inside wall – oriented in its vertical position. Several minutes later, without warning or personnel interference, the ladder fell and struck another operator in the back of the head. If a portable ladder is not in use, ensure it ismechanically secured to prevent displacement. Devices such as latches, ropes, straps, or bracketsmay be used. If a ladder cannot be properly secured, it should be oriented horizontally on the floor or ground, and out of walking and working areas. Taking the time to properly secure ladders will prevent personnel injuries and equipment damage.
2025-11-13	Lessons Learned, Sandia National Laboratories (SNL)	**Always Evaluate Stability When Rigging and Lifting** Workers were preparing to lift and rotate a 13-meter-long wind turbine blade using A-frame gantry hoists, straps, and a lifting saddle designed to control blade roll while suspended. The blade was positioned on the ground, supported by a stand at the root end and a cradle located two-thirds of the way along its length. However, the blade was not bolted to the root stand; it was merely resting on top with two points of contact that constrained it from rolling. <u>What happened?</u> • Blade rotated out of cradles and fell during lift; no injuries. • Worker lifted blade without saddle; did not pause to reassess. • Knowledge from training not applied effectively in practice. <u>Why did it happen?</u> • Lack of stability due to absence of lifting saddle; root not secured. • Assumed lift could proceed; safety protocols not followed. • Reliance on theoretical knowledge without practical reinforcement. <u>What was done to reduce recurrence/Improvements and results</u> • During lifting operations, if the lift or preparation does not proceed as planned, it is crucial to stop and evaluate the situation. • Always assess every lift for two key requirements: load capacity and stability of the center of gravity. Consider the stability of the center of gravity in all three dimensions.

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		• On-the-job training (OJT) should reinforce classroom learning in job-specific contexts. OJT should foster thought patterns that recognize best practices and potential mistakes relevant to the task at hand.
2025-11-25	LL-25-1032	**Robotic Obsolescence** Robotic systems for the Box Encapsulation Plant (BEP) at Sellafield in the UK were procured early in the design phase to support operator training and control system development. While this approach provided early integration benefits, it introduced a significant lifecycle risk. Unlike manufacturing environments (e.g., car production) where industrial robots are used routinely and development cycles pose minimal issues, the extended design phase for BEP meant that the selected robotic systems risked becoming obsolete before operations commenced. This creates challenges such as limited availability of spares and no straightforward path for replacements during the operational phase. To mitigate these risks, several options were considered: • Design Flexibility: Ensure the system architecture allows for substitution with similar robotic platforms that meet functional requirements. • Advance Procurement of Spares: Secure critical components early to maintain operational resilience. • Secondary Market Strategy: Explore procurement of second-hand systems as a contingency for replacing robots during operations.
2025-11-25	LL-25-1033	**Safe Robotics Operations** The UK Atomic Energy Authority (UKAEA) has decades of experience in robotics tele-operation, with proven practices to ensure efficiency and safety. Their control rooms typically employ multiple operators, usually three to four, each assigned to a critical role: • Primary System Control: Operates the remote robotic system. • Visual Management: Adjusts camera angles and manages digital twins to provide optimal situational awareness. • Workflow Coordination: Guides the main operator through procedures and manages task sequencing.

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		• Safety Oversight: Monitors operations for safety, manages operator fatigue, and has authority to initiate emergency stops or system shutdowns if unexpected or unsafe conditions arise. This multi-operator model ensures robust safety, operational resilience, and effective task execution in complex environments.
2025-11-25	LL-25-1025	**Lessons from Lingen BWR Decommissioning** The Lingen nuclear powerplant is a BWR located in Germany that operated from 1968 to 1977. The reactor is in the process of being decommissioned and the majority of the reactor building internals have been removed. The reactor pools and reactor are currently in the process of being dismantled. Reactor Segmentation at CNL has seconded an SME from the team to participate and support the decommissioning activities at Lingen. Through the secondment lessons learned and operating experience has been documented and shared with the RS and Mechanical Equipment Design (MED) team. Although Lingen and the G1 reactors have different architecture, these lessons are still applicable to decommissioning approach and tooling design. One of the lessons learned from the Lingen decommissioning is to adequately plan out the route of all equipment into and out of the reactor building, TVEs, airlocks, etc. and to ensure proper clearance of all equipment during the planning phase of the project. During the decommissioning, some challenges were encountered when trying to move heavy equipment to and from the work site due to the limited space inside of the RB. Another lesson for field work planning is to have daily pre and post job briefs with all members of the field team present as well as SMEs such as RP, health physics and OSH to ensure everyone understands the plan for each day as well as discuss safety considerations. Having the pre-jobs in person with all members present allowed for everyone to be on the same page as well as allow for efficient changes to plans if required. The Lingen reactor pressure vessel has a maximum thickness of 40cm and was segmented using an oxy/propane torch mounted to a remotely operated axis. Lessons learned were gathered from this experience including how much off-gassing was produced and how the HEPA stations reacted to it. Lessons were also learned in terms of how much slag and contamination was produced from the cutting. Other lessons in tooling design include the camera set up for thermal cutting and designing tooling for ease of assembly and decontamination.

2025-12-04	2025-UTB-ORNL-0014	**Potential Shock Event Highlights Need for Clear Expectations in Pre-Job Briefings** During the commissioning of newly installed equipment, a subcontractor was observed performing a voltage test on the energized equipment. The subcontractor was not fully aware that they were prohibited from performing energized electrical work. An ORNL employee had performed an informal pre-job briefing, however it did not make electrical work expectations clear. Although told that utility connections must be performed by ORNL staff, the subcontractor misinterpreted this to mean they could still work on their own equipment. This incident underscores the critical need for clear communication and hazards identification in pre-job briefings. Additionally, employees need to be trained in how to provide effective subcontractor oversight. This event occurred on May 19, 2025. After the disconnect to the equipment was energized, the subcontractor quickly checked the incoming voltages for the equipment with a multimeter. The subcontractor was potentially exposed to 208 volts ac. No shock or injury occurred. Two ORNL electricians observed the violation shortly after turning on the disconnect to the equipment; they reported the situation to their supervisor the following day. The supervisor notified division management, and the Laboratory Shift Superintendent (LSS) was informed. <u>Analysis:</u> A causal analysis was conducted as described in the Standards-Based Management System (SBMS) causal analysis procedure. Root and contributing causes were identified. The root cause of this event was the progress of the task was not adequately tracked. The original Technical Project Officer (TPO) delegated responsibilities to the Group Leader (GL), who further delegated them to a subordinate despite them not being a qualified TPO. While the GL initiated escort-related training due to subcontractor requirements, they failed to assign the mandatory TPO training and did not ensure the subordinate was qualified prior to commencement of work. The subordinate was unaware of TPO responsibilities, leaving their role unclear. There were several factors that contributed to this event: • The responsibilities of the employee overseeing the subcontractor were not well defined, understood, or carried out for the task. • The pre-job brief covered only general hazards, not specific job hazards or controls required for the task. • Electricians exhibited lack of intervention when presented with an adverse condition. <u>Lessons Learned:</u> • It is important that employees are properly trained and understand the responsibilities to effectively oversee a subcontractor working in ORNL lab spaces. • It is important that all parties have a clear understanding of their roles and responsibilities

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		during a given task. • It is important that all parties understand the importance of immediately calling a stop work when a safety violation is observed. <u>Recommended Actions:</u> • Issue a new pre-job briefing procedure to address delegation and training requirements and define the employees that will be required to obtain awareness/training on this procedure. • Implement required training on the pre-job brief procedure. • Create new SBMS subject area for Subcontractor Oversight including a new Subcontractor Field Representative (SFR) role and revise the existing TPO role. • Deploy revised TPO Training. • Revise Purchasing Goods and Services Subject Area to incorporate changes due to the implementation of the new Subcontractor Oversight Subject Area, with focus on role changes. • Evaluate and implement changes needed to the TPO role request process.

3. References

[1] *Gentilly-1 Waste Facility Detailed Decommissioning Plan Volume 1: Program Overview*, 61-508310-DDP-001817, Revision 1, 2024 August 16, 67081844.

[2] *Processing Internal and External Operating Experience,* 900-514000-MCP-001, Revision 0, 2017 March 22, 12496502.

[3] *Integrated Work Control,* 900-514100-STD-002, Revision 4.1, 2024 April 23, 51505551.