DECOMMISSIONING PROJECTS AT THE CHALK RIVER LABORATORIES OVER THE NEXT 5 YEARS AND THE CHALLENGES WITH DELIVERY

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ABSTRACT

Nuclear research and development carried out on behalf of the Government of Canada have resulted in 60 years of nuclear legacy liabilities at the Chalk River Laboratories. The liabilities consist of shutdown reactors, research facilities and supporting infrastructure. The Government of Canada in 2006 initiated a five-year, $520 million start-up phase and in April 2011 entered the next 5-year program of decommissioning as part of the long term strategy to address the legacy liabilities. A number of planned projects in Facilities Decommissioning, at the Chalk River Laboratories, have been defined for the next 3 years and will be described in this paper in combination with operational lessons learned for future decommissioning project work.

1. INTRODUCTION

The Chalk River Laboratories (CRL) is the Canadian nuclear research facility located near Chalk River, Ontario, approximately 180 km north-west of Ottawa, on the Trans-Canada Highway. CRL is a site of major research and development to support and advance nuclear technology. CRL has expertise in physics, metallurgy, chemistry, biology, and engineering and consists of both operating and shutdown unique research facilities. CRL was conceived in 1942 from collaboration between British and Canadian nuclear researchers, where a research laboratory established in Montreal under the National Research Council of Canada (NRC). By 1944, CRL was opened and in September 1945, the facility saw the first nuclear reactor outside of the United States go operational. In 1946, NRC closed the Montreal laboratory and focused its resources at CRL.

In 1952, Atomic Energy of Canada Limited (AECL) was created by the government to promote peaceful use of nuclear energy and took over operation of Chalk River from the NRC. Throughout the 1950s through the turn of the century, various nuclear research reactors have been operated by AECL for production of nuclear material for medical and scientific applications.

Nuclear legacy liabilities are the result of over 60 years of nuclear research and development conducted by the NRC and AECL, (1946 to 2006) on behalf of the Government of Canada. The liabilities consist of outdated and unused research buildings, associated infrastructure, buried and stored radioactive waste and affected lands. The Nuclear Legacy Liabilities Program (NLLP) is a Government of Canada program to safely and cost-effectively reduce legacy liabilities and associated risks at AECL sites, based on sound waste management and environmental principles, in the best interests of Canadians. In 2006, the Government of Canada launched the NLLP with a $520 million funding commitment for a five-year start-up phase. The program is implementing a long-term strategy that will run for up to 70 years [1].

The objective of the NLLP is to safely and cost-effectively reduce risks and liabilities based on sound waste management and environmental principles in the best interests of Canadians. The first five-year start up phase was directed at addressing health, safety and environmental priorities, accelerating the decontamination and demolition of shutdown buildings, and laying the groundwork for future phases of the strategy. It is through this program that AECL has delivered many decommissioning projects. During the first five-year plan, nuclear legacy liabilities were reduced at the CRL site by accelerating the pace of building decommissioning with activities such as [1]:

- Decontaminating and demolishing a large radioisotope laboratory (2,800 m^2) and the former plant hospital;
- Draining a leaking portion of a spent fuel handling bay and removing a 30 meter section of the wooden structure that connected the bays to the NRX Reactor; and
- Decontamination and demolition of a redundant Site Security Access Building.

The NLLP in April 2011 entered the next phase of the program [2]. A number of planned projects in Facilities Decommissioning have been defined for the next 3 years and will be described in this paper.

2. DECOMMISSIONING PROJECT WORK

2.1 Decommissioning Programmatic and Licensing Requirements

Decommissioning activities at CRL are carried out in accordance with AECL's established radiological and industrial safety programs and applicable procedures. Decommissioning planning and execution is controlled through the Facilities Decommissioning (FD) Quality Assurance Plan. The Quality Plan applies to all decommissioning activities, nuclear and non-nuclear, at the CRL Site, meets the requirements of the Canadian Standards Association [3] and addresses the following:

- Overall monitoring, surveillance, and maintenance of non-operating facilities that have been transferred for decommissioning, and
- Management and reduction (including demolition) of Health, Safety, Security and Environment (HSSE) risks and liabilities for facilities transferred to FD.

In addition, all Nuclear Facilities, listed in the CRL Operating License, require approval from the Regulatory Authority before any decommissioning activities commence. The Canadian Nuclear Safety Commission (CNSC) licenses decommissioning activities in Canada and has published regulatory guides, Guide G-219 [4], that dictate how AECL acquire approval to decommission nuclear facilities. In accordance with these guides, AECL Decommissioning Planning Branch works with the CNSC to complete an Environmental Assessment (EA) and a Detailed Decommissioning Plan (DDP). Once these plans are finalized, AECL submits an application to the CNSC to move the plant or facility from operations to decommissioning on the site license. The Decommissioning Program Execution Branch receives an approved DDP and EA which is a pre-requisite to commencing field decommissioning operations.

2.2 Decommissioning Project Planning and Selection

In accordance with the CNSC Regulatory Guide G-219 [4], AECL has developed a comprehensive, 70-year Comprehensive Preliminary Decommissioning Plan [5]. The strategy consists of individual decommissioning projects for CRL's various components over time rather than a single project for the entire site at a designated end of operational life in the future.

Priorities for decommissioning projects are established based on HSSE risks and also takes into consideration operational requirements and business priorities.

The primary focus of decommissioning projects in the near term is the removal of redundant facilities, preparations to support future removal of facilities and reduction of hazards associated with CRL's other buildings with storage-with-surveillance until decommissioning may be carried out. The projects proposed are based on factors such as (1) HSSE risks; (2) their availability considering other site missions that may lead to a continuing need for them, and (3) alignment the Comprehensive Preliminary Decommissioning Plan [5]. The following is a list of redundant Nuclear Facilities, listed in the CRL site licence that will be decontaminated and subsequently demolished over the next five years:

- Facilities associated with NRX Reactor, mainly, the Heavy Water Salvage Building; the Process Sewer Monitoring Building; and the NRX Exhaust Stack Duct; and
- The Drum Handling/Cleaning Buildings; the office portion of the former Thorium Reprocessing Laboratory; and the Fire Hall and associated facilities.

In addition, the following are Nuclear Facilities listed in the licence, that will be have the hazard reduced through decontamination and decommissioning of existing services with the structures returned to Operations for reuse:

- The Pool Test Reactor will be decommissioned, the pool drained and all reactor components removed; and
- The Heavy Water Upgrading Plant will be decontaminated and the tritium-contaminated equipment removed. Both structures will be returned for reuse.

Finally, preparations will be made to demolish and reduce the hazards associated with the following redundant Nuclear Facilities listed in the licence facilities such as:

- The Waste Water Evaporator Building; and
- Select ancillary buildings associated with NRX Reactor, mainly, the removal of the two large Delay Tanks.

3. DECOMMISSIONING OF REDUNDANT NUCLEAR FACILITIES

3.1 Decommissioning of NRX Ancillary Buildings

AECL has implemented a three-phased approach to the decommissioning of the NRX Reactor ancillary buildings. In Phase 1, the NRX buildings, which consists of 9 ancillary buildings, were put into a safe, sustainable shutdown state, which involved making the building secure, establishing a maintenance regime and carrying out routine and emergent repairs. Currently, AECL is in Phase 2, "Storage with Surveillance" phase, for NRX and Ancillary Buildings, which is a planned stage during a decommissioning program where the remaining contaminated materials and equipment are maintained under controlled surveillance for a specified period of time. Licensing control by the CNSC remains in effect during these periods. Final decommissioning of the NRX ancillary buildings will occur in Phase 3. This phase, which will be implemented through a series of sub-phases, will result in the removal of the buildings and structures and the return of the land for site reuse. Decisions regarding the initiation of Phase 3 and the sequencing of the decommissioning activities were based on an analysis of the relevant safety issues, costs, benefits, risks and priorities at that time.

The total waste expected to be generated during the decommissioning of the NRX ancillary buildings over the next 5 years is approximately 1,800 m^3 for the total decommissioning, demolition and site remediation of the identified facilities. Based upon experiences to date with decommissioning activities, generally project waste arisings will be disposed or processed off-site wherever practicable so that the limited disposal and storage facilities at Chalk River are not un-necessarily over burdened.

3.1.1 Heavy Water Salvage Building

The Heavy Water Salvage building is a single-story, wood-frame structure approximately 5 m x 3.6 m over a concrete basement area that is attached to the NRX Reactor building. The Heavy Water Salvage system was designed to permit the recovery of heavy water if there was a leak of heavy water into the sump in the NRX Reactor Building. The most likely source of such a leak was from a potentially ruptured calandria tube.

The decommissioning scope for the Heavy Water Salvage building will include the removal of the building services within one meter of the building, removal of the building contents, followed by demolition of roof, walls and floor. Once the wooden structure, along with the building contents, is removed, it is planned to install a metal cover over the concrete basement to protect it from the elements. Since this basement is an integral part of the NRX Building, it will be included within the scope of decommissioning NRX. Field work for the project is scheduled to commence September 2013 and completion by December 2014. The decommissioning project has been scheduled in order of priority of hazard reduction, funding and resource availability.

3.1.2 Effluent Monitoring Building

The Effluent Monitoring Building is a single-story, wood-frame structure with a concrete basement. The approximate outside dimensions are 3.4 m x 3.4 m. The building houses the equipment that monitored the liquid effluent in the Process Sewer.

The decommissioning scope for the Effluent Monitoring Building includes the removal of building services within one meter of the building, removal of the building contents and subsequent demolition of the building and concrete basement. The foundation will be broken up and excavated with careful segregation of contaminated concrete from the Likely Clean concrete. Field work for the project is scheduled to commence September 2014 and be completed March 2015. The decommissioning project has been scheduled in order of priority of hazard reduction, funding and resource availability.

3.1.3 NRX Exhaust Stack Duct

The Above Ground Ventilation Stack Duct, in Figure 1, is located in the Outer Supervised Area of CRL; it comprised of 32 sections of Ventilation Duct approximately 1.2 m diameter, supported by steel angle frames attached to concrete bases. Individual Ventilation Duct sections are approximately 18 m in length with lesser sections of 12 m. The overall length of the Ventilation Duct is approximately 550 m.

Figure 1. View of B157 stack duct sections.

The Ventilation Stack Duct served as the main ventilation duct for the NRX and NRU Reactors but was placed in a safe shutdown state in 1992 when a new underground duct was brought into service, rendering the above ground section redundant. In recent years, surveillance and maintenance has not been rigorously applied resulting in containment barrier deterioration. Therefore, the current strategy is that during the summer of 2011, three sections of the stack duct will be removed using a mobile crane. The sections of duct will be size reduced and packaged ready for shipment to a commercial waste disposal provider. Included with the radiological hazards that need to be considered, there is a fire hazard due to hot cutting and the proximity of the duct to the forest through which the duct runs. Lessons learnt during delivery of the initial work scope will be used to finalize the decommissioning plan for the remaining duct sections. Assessment and design work is scheduled to commence late in 2011 to coincide with funding arrangements.

3.2 Decommissioning the Pool Test Reactor (PTR)

The PTR was a low power, light-water moderated, pool-type reactor fuelled with highly enriched uranium (HEU). Criticality was first achieved on November 9, 1957 and was operated intermittently up until October 1990 when it was shut down and defueled. The pool is approximately 4.5 meters square by 6 meters deep and contains approximately 125,000 litres of water. The reactor core, submerged in water to a depth of 4 meters, contained an array of typically 14 fuel rods surrounded by a graphite reflector. The fuel was removed from the PTR and eventually repatriated to the USA. All remaining fissionable material was removed from the pool in May 1992. The control and safety rods and the ion chambers have been removed. The PTR was shut down in 1990 and was placed in a shut down state with monitoring and surveillance.

The overall end-state objective for the PTR decommissioning project will involve the removal of the PTR systems, components, and support structures, draining of the pool and removing the pool's water supply and purification system.

The total waste arising from the decommissioning of the pool is estimated to include 14000 kg of metals including 4800 kg of graphite and a small quantity of miscellaneous waste. It is anticipated from the sampling and characterization recently performed that most items will be able to be decontaminated to a point of release as clean material and will therefore not require any further processing or long term storage as radioactive waste. In addition, the 125,000 litres of pool water will be treated at CRL Waste Treatment Centre and released to the site process sewer.

Fieldwork is expected to take 5 months with the facility returned to the site landlord for other uses. Detailed Work Plans are being developed to conduct the decommissioning activities and it is anticipated that they will be completed by Fall 2011 and the room will be returned March 2012 following CNSC acceptance of the End-State Report.

3.3 Decommissioning of Heavy Water Upgrade Plant (HWUP)

The HWUP facility, in Figure 2, was constructed in 1967 to remove contaminants and upgrade the isotopic composition of heavy water to reactor-grade specifications (greater than 99.75% D_2O), using an electrolytic process. AECL officially retired the HWUP from operations in 1998 and subsequently placed the facility into an Extended Shutdown State in which it remains today.

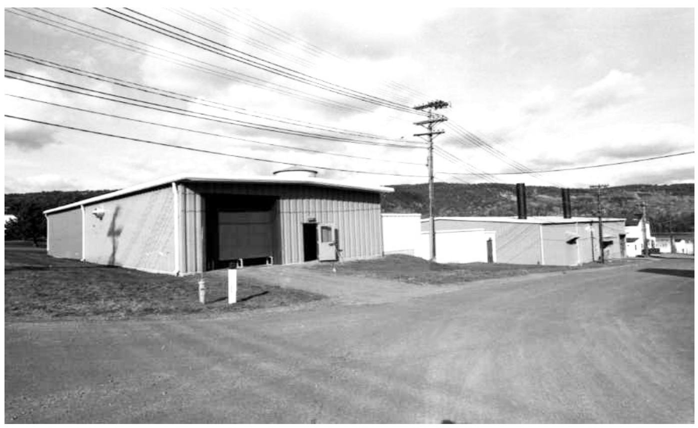

Figure 2. Heavy Water Upgrade Plant.

The HWUP is embedded in the controlled area of the CRL site surrounded by operating and non-operating facilities. The facility is comprised of two single-story "Butler" type steel frame insulated buildings (Figure 2 - Building 1 (left) and Building 2 (right)) linked by an enclosed walkway as well as an outdoor underground storage tank area. Building 1 covers an area of about 1000 m^2 and is divided into two main areas: a drum handling/shipping/receiving area and a process area. Building 2 covers an area of approximately 200 m^2 and houses five heavy water storage stainless steel tanks (four 11,000 L capacity and one 22,000 L capacity) that were used for holding downgraded heavy water. Seven storage tanks, each with a capacity of approximately 45,000 L, are located underground between Buildings 1 and 2. These outside underground storage tanks were used to store bulk quantities of low-grade tritiated heavy water.

The heavy water brought into the facility contained tritium and small amounts of other fission and activation products. The establishment of the Extended Shutdown State following termination of facility operations has significantly reduced the radiological hazards. The current status of the facility is such that:

- All process equipment used for heavy-water cleaning and upgrading has been flushed, shutdown and isolated;

- Bulk inventories of heavy water containing tritium were removed from tanks and process piping to the extent possible and remaining heels have been characterized with regard to chemical and isotopic composition; and
- Ion exchange columns and the solids evaporator tank were removed, thereby removing a localized beta/gamma hazard.

AECL completed a comprehensive radiological characterization program in 2001 to quantify and document the radiological conditions, identify any residual hazards and determine appropriate precautions to minimize their potential impact on health, safety and the environment during decommissioning. The overall conclusion from the radiological characterization exercise is that hazards are contained, generally low and well understood. The most abundant nuclide remaining in the facility is tritium. The remaining tritium inventory within the HWUP facility is fixed in the steel and PVC piping and vessels, and is present in the remaining rinse water and sludge.

The strategy adopted for the decommissioning of this building includes for the removal of non-hazardous materials, asbestos contaminated materials, redundant process equipment from the process area and the removal of the underground storage tanks and qualification of the entire former facility for industrial re-use. The overall objective will be attained in two phases. Phase 1 includes the removal of redundant process equipment from the drum handling area of the building and the removal of the interior storage tanks and redundant equipment from the bulk storage area. Phase 2 includes the removal of redundant process equipment from the main process area in the main building, the removal of the underground storage tanks and qualification of the entire former facility for industrial re-use.

The time frame to execute the field activities to decommission the HWUP facility is not expected to exceed three years. Present plans are to complete Phase 1 activities within a twelve-month period and Phase 2 activities are expected to extend over a two-year period. Planning, design, assessment and characterization are scheduled to be completed for the start of the 2012 fieldwork. Asbestos is the main hazardous non-radiological substance in the facility. A small quantity of polychlorinated biphenyl (PCB) may be present in fluorescent light ballasts; however, standard industrial substances such as acids, alkalis and solvents were removed from the facility as part of the establishment of the Extended Shutdown State.

The overall end state objective for the HWUP is to remove all process equipment, tanks and piping and qualify all remaining areas of the buildings for industrial re-use as determined by AECL's business needs. All interior areas will be qualified as Radiological Safety Zone-2 ("low hazard"), or better, as defined by AECL's Radiation Protection Requirements. It is anticipated that 932 m^3 of waste that consists of likely clean, contaminated and hazardous materials will be removed from the facility as a result of decommissioning activities.

Active fieldwork identified in the above phases is scheduled to commence in 2011 and the decommissioning of the HWUP facility including removal of hazardous materials, decommissioning of process equipment with underground tank removal and ground remediation expected to be completed by 2015.

4. DECOMMISSIONING OF REDUNDANT NON-NUCLEAR LISTED BUILDINGS

4.1 Drum Handling/Cleaning Buildings

The Drum Handling/Cleaning Buildings were constructed in two stages. The building was built first in 1945 (stage 1) and served as the 'Polymer Storage Building', where it was used to handle part of the heavy water inventory. Heavy water upgrading was transferred to the Heavy Water Upgrade Plant in 1970 and Drum Handling/Cleaning Building was refitted (stage 2) as a drum cleaning facility. The drum cleaning ceased in 2000. The facility was subsequently used by Radiation Protection staff for large equipment decontamination. The facility also accommodated commercial decommissioning activities and these latter activities may have introduced radioactive contaminants not usually found at CRL.

The building is planned to undergo a radiological survey, characterization and assessment in preparation for removal of internal partitions, process systems and services prior to final demolition. The Detailed Decommissioning Plan will take into account past heavy water storage activities, drum cleaning, mixed waste storage and equipment decontamination work as a variety of radionuclides can be present in the facility, including Tritium, fission products and possibly actinides.

The route for the waste arising from the decommissioning activities will be determined following survey and characterization. Fieldwork is scheduled to commence April 2014 and be complete by January 2016. This decommissioning project has been scheduled in order of priority of hazard reduction, funding and resource availability.

4.2 Thorium Reprocessing Laboratory Offices

The Thorium Fuel Reprocessing Plant Offices, which was erected in 1946/1947, was originally part of the thorium fuel reprocessing plant. The northern portion of the building was converted to office space in the mid 1960s, was used to recover U-233 in two extraction lines. The building has a footprint of 270 m^2. Beginning in 1954, one of the extraction lines was removed to make room for a fission product (Sr-90 and Cs-137) production plant. The plant never operated actively. It was removed in 1960 and replaced with an ion exchange purification system. The de-ionization system was installed to treat the water from both the NRU and NRX rod bays, to provide make-up water for the bays and de-ionized water for use in the radiological laboratories. It is planned to commence assessment and prepare decommissioning documentation for the Laboratory portion of the building commencing in 2013. This portion of the building has a footprint of 870 m^2.

The office portion of the building has a wood frame and the outside walls are covered with transite shingles as the rest of the building and are physically separated from the main facility. Most of the rooms found on the first two floors of the building are former offices with one conference room, one lounge area, washrooms, a storage room and an equipment room.

The plan during the next 3 years is to focus on preparing the office portion of the building for demolition. The major tasks that will be completed include the preparation of project planning documents, the removal of all hazardous/designated substances and decontamination activities to prepare the building for demolition. A structural assessment will be required to enable separation of the office portion of the building from the main Thorium Reprocessing Laboratories. Field work is scheduled to commence 2015 with completion of the project during 2016. The building and process systems will be subjected to full characterization and assessment commencing in 2013. Due to the proximity to the Laboratory and its likely previous usage the office areas will be subjected to detailed radiological surveys to determine method of decommissioning and waste disposal routes.

4.3 Fire Hall

The Fire Hall has been part of the CRL site since the beginning in 1944 and included emergency response vehicle parking, main control room and fire fighters' living quarters. The original wood framed building consists of 12 m x 13.5 m x 3.6 m fire hall with a small 3.5 m x 3.5 m x 12 m tower centered on the east façade for fire hose repair and drying.

Due to the age of the building, asbestos, lead paint, and PCBs in the lighting ballasts are all likely to be present within the construct of the building, and therefore pose a hazard during demolition.

The Fire Hall and associated garages are presently undergoing characterization and assessment in preparation for removal of internal fabric, alarms and services and mechanical demolition. The waste arising from the decommissioning of the building is estimated as being 695 m^3 and is assumed to be clear of radiological contaminants based on our Lessons Learned during the demolition of similar facilities at Chalk River. However, a full clearance survey of the waste will be completed prior to release of the waste materials to confirm a path for disposition. Final dispositioning is performed by the Waste Planning and Processing Team where lower background radiation is recorded and an in-depth monitoring program is performed. All materials declared Clean pass through the Bicron Truck Monitors as part of the final clearance of the waste. Fieldwork for this project is scheduled to commence during the 2012/13 Fiscal Year. The project commenced assessment activities in 2011 and preparation of the decommissioning support documentation is underway. Full decommissioning and demolition is scheduled to be performed in 2012.

5. REDUCING HAZARDS IN REDUNDANT NUCLEAR FACILITIES

Facilities Decommissioning plans to reduce the hazards within the redundant nuclear licensed listed facilities prior to demolition, such as the Plutonium Recovery Laboratory, the Waste Water Evaporator Building and the NRX Ancillary buildings.

5.1 Waste Water Evaporator Building

The Waste Water Evaporator Building is a 15 m x 8.6 m building of timber frame construction on a 1.2 m concrete pad. It was constructed in 1952 originally as a facility for the processing and treatment of radioactive liquid waste product generated from the NRX Reactor fuel reprocessing work carried out in the Plutonium Recovery Laboratory, the Thorium Reprocessing Laboratory and the Plutonium Tower. This liquid product contained concentrations of fission products in nitric acid and ammonium nitrate. The product was subject to column solvent extraction to remove residual plutonium and uranium in a "Uranium Recovery Plant" that was located in part in a wooden tower extension of the building (removed in 1960). The uranium-free liquid waste ("fission product stream") was then concentrated in an evaporator located in a shielded area of the building. These processing and treatment operations were carried out until 1958, at which time these fuel-processing activities had ceased. Liquid waste evaporation operations were carried out sporadically from 1958 to 1967 to concentrate approximately 450 m^3 of stored process wastes remaining from earlier fuel processing. No further processing activity has occurred in the building since 1971. The facility has been maintained in a shut down state since 1990.

Decommissioning will involve the removal of all hazards and will include an assessment of the potential worker exposure to radiological, chemical and industrial hazards. Given the history of many leaks of highly active liquids (fuel reprocessing wastes) over roughly 15 years of operation, considerable contamination exists throughout the building. Much of contamination exists as fixed sources, but significant levels of loose contamination also exist. The dominant radionuclides present as contamination sources include longer-lived fission products such as Cs-137 and Sr-90 (both with progeny). Recent reference hazard characterization activities have identified the presence of Am-241, Pu-238, Pu-239/240, and the uranium isotopes U-234, U-235, U-236 and U-238.

The preparation of the decommissioning strategy for the building is scheduled to commence late 2011 and will consider safe access and egress, waste handling and packaging and full containment during process system removal and the decontamination, size reduction and packaging of waste arisings. One option under consideration would be the erection of a full ventilated enclosure over the whole facility. Fieldwork is scheduled to commence in 2016 with decommissioning and building demolition. The estimated quantity of radioactive waste from the decommissioning of the building is 710 m^3. The execution of fieldwork is estimated to take 18 months to complete and will commence in 2016. There is however much design and safety assessment work to be completed, this is scheduled to be performed commencing 2012 with the preparation of Detailed Plans, Radiological Assessments, design of temporary facilities and full characterization of the facility.

5.2 NRX Ancillary Delay Tanks

The NRX Reactor Delay Tanks were fabricated by the Toronto Iron Works from mild steel plate in 1945. The tanks are located, approximately 80 m from the NRX Reactor building.

Delay Tank #1 is 14.6 m diameter, 7.6 m high and is situated on a concrete foundation. The tank is buried in the hill, which has an incline of approximately 45^o. The tank has a conical shaped roof protruding above grade level with a small timber-frame valve house. Delay Tank #2 and its associated Valve house are essentially identical structures to Delay Tank #l. The volume capacity of each tank is approximately 1,300 m^3. The NRX reactor cooling water was first received in Delay Tank #1 and then flowed through Delay Tank #2, before being returned to the Ottawa River through the Process Sewer. The tanks were designed to allow short-lived radio-isotopes to significantly decay before discharge (primarily based on ^{16}N half-live).

Early decommissioning of the Delay Tanks is the current strategy due to the degraded condition of the roof and tank structures, and the potential negative impact collapse of these structures.

The final end-state includes complete removal of the facilities consisting of Delay Tanks # 1 and 2, remediation of soil and ductwork within a reference one meter of the building footprint. Backfilling of soil with grading of the delay tank area will be completed and return to site for reuse. Facilities Decommissioning has initiated the assessment of the structure and intend to have all fieldwork complete by mid 2015. This Fiscal Year, ,the Decommissioning Planning Branch has commenced the assessment of the tanks and have embarked on a campaign of characterization to support the decommissioning plan.

6. LESSONS LEARNT THROUGH DELIVERY OF PROJECT WORK

There have been a number of key experiences identified during delivery of decommissioning projects in the first five-year plan that are readily applicable to the next 5-year program:

- Planning is paramount when delivering decommissioning projects on an operational site with multiple site missions;
- Accurate and detailed characterization to enable for detailed project planning in facilities heavily contaminated with radioactivity is essential;
- The provision of adequate and qualified resources to deliver the full-spectrum of decommissioning projects on an Operation site is not guaranteed. Emergent, higher priority work will continually take precedence; and
- A fully integrated and balanced decommissioning team involving internal resources, supplemental personnel and specialist contractors improves greatly the chances of success.

7. SUMMARY

The Chalk River site is an old and complex Operational site with a variety of missions and a number of facilities that were constructed rapidly during or immediately after World War 2. The structures are primarily timber construction that do not meet modern codes and have various research tenants over their 50 plus years in existence. AECL has developed a comprehensive, 70-year decommissioning and waste management strategy and implementation plan, and in partnership with Natural Resources Canada are implementing the plan through the NLLP.

AECL, through the application of lessons learned, partnerships with industry and rigorous planning, will continue to implement decommissioning projects per the CRL site decommissioning plan, focusing on the removal of redundant facilities, preparations to support removal of facilities during the future phases and the reduction of the hazards associated with CRL's high-priority buildings.

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