LA CROSSE BOILING WATER REACTOR

LICENSE TERMINATION PLAN

CHAPTER 3

IDENTIFICATION OF REMAINING SITE DISMANTLEMENT ACTIVITIES

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LIST OF ACRONYMS AND ABBREVIATIONS

ALARA	As Low As Reasonably Achievable
ACM	Asbestos Containing Material
AMSL	Above Mean Sea Level
BSFR	Bulk Survey For Release
CCW	Component Cooling Water
CST	Condensate Storage Tank
D-Plan/ PSDAR	Decommissioning Plan/Post Shutdown Decommissioning Activities Report
FESW	Fuel Element Storage Well
FRS	Final Radiation Survey
G-3	Genoa Fossil Station
GSTV	Gas Storage Tank Vault
HPSW	High Pressure Service Water
HVAC	Heating Ventilation Air Conditioning
kVA	kilo-Volt-Ampere
ISFSI	Independent Spent Fuel Storage Installation
LACBWR	La Crosse Boiling Water Reactor
LPSW	Low Pressure Service Water
LSA	Low Specific Activity
LSE	LACBWR Site Enclosure
LTP	License Termination Plan
NRC	Nuclear Regulatory Commission
ODCM	Off-site Dose Calculation Manual
OHST	Overhead Storage Tank
REMP	Radiological Environmental Monitoring Program
RPV	Reactor Pressure Vessel
RWP	Radiation Work Permit
WTB	Waste Treatment Building

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3. Identification of Remaining Site Dismantlement Activities

3.1. Introduction

In accordance with 10CFR50.82 (a)(9)(ii)(B), the License Termination Plan (LTP) must identify the remaining major dismantlement and decontamination activities for the decommissioning at the time of submittal. The information includes those areas and equipment that need further remediation and an assessment of the potential radiological conditions that may be encountered. Estimates of the occupational radiation dose and the quantity of radioactive material to be released to unrestricted areas during the completion of the scheduled tasks are provided. The projected volumes of radioactive waste that will be generated are also included. These activities will be undertaken pursuant to the current 10 CFR 50 license, are consistent with the La Crosse Boiling Water Reactor (LACBWR) *Decommissioning Plan and Post-Shutdown Decommissioning Activities Report* (D-Plan/PSDAR) (1) and do not depend upon LTP approval to proceed.

The LACBWR site will be decontaminated and dismantled in accordance with the DECON alternative, as described in NUREG-0586 *Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, Supplement 1, Volume 1* (2). Completion of the DECON alternative is contingent upon continued access to one or more low level waste disposal sites. Currently, LaCrosse*Solutions* (Solutions) has access to low-level waste disposal facilities located in Andrews, Texas and at the Energy*Solutions* facility located in Clive, Utah.

Decommissioning activities are being coordinated with the applicable Federal and State regulatory agencies in accordance with plant administrative procedures. Applicable Federal, State and local regulatory agencies are listed in section 8.7.2 of LTP Chapter 8.

Decommissioning activities at LACBWR will be conducted in accordance with the requirements of 10 CFR 50.82(a)(6) and (a)(7). At the time of LTP submittal, the remaining activities do not involve any un-reviewed safety questions or changes in the Technical Specifications for LACBWR. If an activity requires prior NRC approval under 10 CFR 50.59(c)(2), or a change to the technical specifications or license, a submittal will be made to the NRC for review and approval before implementing the activity in question.

Decommissioning activities are conducted under the Solutions Radiation Protection Program, Safety and Health Program, and Waste Management Program Activities conducted during decommissioning do not pose any greater radiological or safety risk than those conducted during operations, especially those during major maintenance and outage evolutions.

The remaining decontamination and dismantlement activities that will be performed are described in section 3.3. The specific system considerations that will be taken into account are discussed in sections 3.3.2 through 3.3.7. These sections provide an overview and describe the major remaining components of contaminated plant systems and, as appropriate, a description of specific equipment remediation considerations. Table 3-1 contains a list of major systems and components that have been or are to be removed.

Table 3-1 Status of Major LACBWR Systems and Components as of June 2015

System or Component	Status
Forced Circulation System	Partially Removed
Reactor Vessel Internals	Removed from site
Reactor Vessel	Removed from site
Main Steam in Reactor Bldg.	In place
Decay Heat Cooling System	In place- Drained
Primary Purification System	Ion Exchangers in place; 90% removed
Feedwater in Reactor Bldg.	In place
Seal Injection System	90% removed
Alternate Core Spray System	50% removed
Gaseous Waste Disposal System	All except underground storage tank removed
Fuel Element Storage Well System	Contents removed- Drained
Component Cooling Water (CCW)	In place- 70% Removed
Hydraulic Valve Accumulator System	In place- Drained
Well Water System	In Place - Isolated from Turbine/Reactor Bldg.
Demineralized Water System	In place- Drained- 50% removed
Overhead Storage Tank (OHST)	In place- Drained
Station and Control Air System	In place
Low Pressure Service Water	30% removed
High Pressure Service Water	Operational
Circulating Water System	Remains in place – pumps de-energized
Condensate and Feedwater Tanks and Heaters	Drained- Condensate Storage Tank remain in place, All Feedwater Heaters removed
Steam Turbine	Removed
60-Megawatt Generator	Removed
Main Condenser & Accessories	15% Removed
Turbine Bldg. Main Steam	Removed

Table 3-1 (continued) Status of Major LACBWR Systems and Components as of June 2015

System or Component	Status
Turbine Bldg. Condensate and Feed	Removed
Turbine Oil and Hydrogen Seal Oil	Partially Removed
Liquid Waste Collection Systems	In place - Partially Operational
Fuel Transfer Bridge	Removed
HVAC Systems	In place – Partially Operational
Electrical Systems	In place- Disconnected
Asbestos Abatement	75% complete

After the balance of the site is remediated and the levels of residual radioactivity are demonstrated to be below the unrestricted release criteria, the 10 CFR Part 50 license will be reduced to the area around the Independent Spent Fuel Storage Installation (ISFSI) and the site will be transferred back to Dairyland under the 10 CFR Part 50 license. Spent fuel and decommissioning activities completed to date are provided in section 3.2.

3.2. Completed and Ongoing Decommissioning Activities and Tasks

3.2.1. Overview

In excess of 2 million pounds of metallic waste have been removed, shipped, and disposed of in addition to the Reactor Pressure Vessel (RPV) and spent fuel storage racks. Removal and disposal of the RPV included disposition of irradiated hardware and all other Class B and C waste.

Waste stored in the Fuel Element Storage Well (FESW) was processed and collected with other Class B/C waste (i.e., resins, filters, and waste barrel contents) and packaged in three liners that were shipped for disposal in June 2007. The RPV containing the reactor internals and 29 control rod blades was filled with low-density cellular concrete with the reactor head installed. Attachments to the RPV were removed and all other appurtenances were cut. The RPV was removed from the Reactor Building and was shipped for disposal in June 2007. After all spent fuel assemblies and fuel debris were placed in dry cask storage in the ISFSI in September 2012, the storage racks and installed components were removed from the FESW.

3.2.2. Dismantlement of Systems and Components

3.2.2.1. Forced Circulation System

The Forced Circulation system and attendant oil systems have been drained. The Forced Circulation pumps, auxiliary oil pumps, and hydraulic coupling oil pumps have been electrically disconnected. All 16 inch and 20 inch Forced Circulation system piping was filled with low density cellular concrete. Four 16 inch Forced Circulation inlet nozzles and four 16 inch outlet nozzles were cut to allow removal of the reactor pressure vessel. Piping located within the reactor cavity was also cut at the biological shield, segmented into manageable pieces, and disposed of. Pumps and piping in the shielded cubicles remain.

3.2.2.2. Seal Injection System

The Seal Injection system provided cooling and sealing water for the seals on the two Forced Circulation pumps and the 29 control rod drive units. This system is drained and approximately 90% removed.

3.2.2.3. Decay Heat Cooling System

The Decay Heat Cooling system was a single high pressure closed loop containing a pump, cooler, and interconnecting piping used to remove core decay heat following reactor shutdown. This system is drained and inoperable.

3.2.2.4. Primary Purification System

The Primary Purification system was a high pressure, closed loop system consisting of a regenerative cooler, purification cooler, pump, two ion exchangers and filters. Ion exchange resins have been removed and the system has been drained. The Primary Purification pump, coolers and 90% of the piping have been removed and disposed as radioactive waste. .

3.2.2.5. Alternate Core Spray System

The Alternate Core Spray system consisted of two diesel-driven High Pressure Service Water (HPSW) pumps, which took suction from the river and discharged to the reactor vessel through duplex strainers and two motor-operated valves installed in parallel. Approximately 50% of the system in the Reactor Building was removed due to interference with the reactor vessel removal and 80% of the piping in the Turbine Building has been removed. Remaining system components are drained and are ready for dismantlement.

3.2.2.6. Gaseous Waste Disposal System

This system routed main condenser gasses through various components for drying, filtering, recombining, monitoring and holdup for decay. This system has been removed with the exception of the underground gas storage tanks and the gas storage tank in the Turbine Building tunnel.

3.2.2.7. Fuel Element Storage Well

The Fuel Element Storage Well (FESW) is a stainless steel lined concrete structure that measures 11 feet by 11 feet by approximately 42 feet deep. When full, it contained approximately 38,000 gallons of water. The FESW cooling system is connected to the well and consists of two pumps, one heat exchanger, one ion exchanger, piping, valves, and instrumentation. All spent fuel and fuel debris, installed components, and storage racks have been removed from the storage well and a fixative was applied to the walls. The system has been drained and is inoperable.

3.2.2.8. Component Cooling Water System

The Component Cooling Water (CCW) system provided controlled quality cooling water to the various heat exchangers and pumps in the Reactor Building during plant operation, serving as a barrier between radioactive systems and secondary cooling systems. The system provided cooling water to Reactor Building Air Conditioner compressors. The dismantlement of this system is approximately 70% complete.

3.2.2.9. Hydraulic Valve Accumulator System

The function of the Hydraulic Valve Accumulator system was to supply the necessary hydraulic force to operate the five piston-type valve actuators, which operated the five rotoport valves in the Forced Circulation and Main Steam systems. The hydraulic system has been drained. The air compressors, water pumps, and other equipment have also been electrically disconnected and drained.

3.2.2.10. Well Water System

Water for this system was supplied from two sealed submersible deep well pumps that took suction through stainless steel strainers, and discharged into integrated pressure tanks. The system supplied water to the plant and office for sanitary and drinking purposes. It was used as cooling water for the two Turbine Building air-conditioning units and the heating boiler blow-down flash tank and sample cooler. The well water system also supplied water for laundry equipment and seal water for the Circulating Water pumps. The Well Water System has been isolated from the Reactor/Turbine building. Well water pump #3 supplies potable water to the Administration Building and Crib House.

3.2.2.11. Demineralized Water System

The Demineralized Water System consists of a lower Condensate Storage Tank with a capacity of 19,100 gallons and an upper Virgin Water Tank, which has a capacity of 29,780 gallons. Both are two sections of an integral aluminum tank located on the Turbine Building office roof. The Virgin Water Tank provided water to the Demineralized Water transfer pumps, which distributed demineralized water throughout the plant. Water was demineralized in batches at Genoa Fossil Station (G-3). The system has been drained.

3.2.2.12. Overhead Storage Tank

The Overhead Storage Tank (OHST) is a 45,000-gallon tank located at the top of, and is an integral part of, the Reactor Building. The OHST served as a reservoir for water used to flood the FESW, cask pool, and upper cavity during cask loading operations. During operations, the OHST acted as a receiver for rejecting refueling water using the Primary Purification system. The OHST also supplied the water for the Emergency Core Spray system and Reactor Building Spray system, and was a backup source for the Seal Injection system. The system is currently drained and inoperable.

3.2.2.13. Station and Control Air System

There are two single-stage positive displacement lubricated type compressors. The air receivers act as a volume storage unit for the station. The air receiver outlet lines join to form a header for supply to the station and the control air systems. This system is currently still operable and is used as needed.

3.2.2.14. Low Pressure Service Water System

Two vertical pumps located in the LACBWR Crib House supplied the system through a duplex strainer unit. The Low Pressure Service Water (LPSW) system supplied the CCW coolers and was the normal supply to the HPSW system through the motor-driven HPSW pump. This system is currently used as the dilution water supply for conducting liquid waste discharges of river water ingress in the turbine building tunnel area. The original system has been simplified to allow dismantlement which is approximately 30% complete.

3.2.2.15. High Pressure Service Water System

The purpose of the HPSW system is to supply fire suppression water. The adjacent coal plant (G-3) maintains HPSW system pressure. The HPSW system is divided into two main loops. The internal loop served the Turbine Building, Reactor Building, and Waste Treatment Building (WTB) interior hose stations and sprinkler systems. The external loop supplies outside fire hydrants and the LACBWR Crib House sprinklers. The external loop was cross-connected with the fire suppression system for G-3. Currently, the system is isolated from the Turbine Building by the removal of isolation valves and installing pipe blanks to allow only external fire loop use.

3.2.2.16. Circulating Water System

Circulating water is drawn into the intake flume from the river by two pumps located in separate open suction bays in the LACBWR Crib House. Each pump discharges into 42 inch pipe that join a common 60 inch pipe leading to the main condenser in the Turbine Building. At the condenser, the 60 inch pipe branches into two 42 inch pipe to the top section of the water boxes. Water enters the top section of the condenser tube side and is discharged from the bottom section tube side. The 42 inch condenser circulating water outlet lines tie into a common 60 inch line which discharges to the seal well from G-3 located approximately 600 feet downstream from the LACBWR Crib House. The Circulating Water System is currently inoperable as the system pumps have been de-energized.

3.2.2.17. Condensate System and Feedwater Heaters

The Condensate System took condensed steam from the condenser hotwell and delivered it under pressure to the suction of the reactor feed pumps. With the exception of the Condensate Storage Tank (CST), this system has been drained and most of the piping has been removed.

3.2.2.18. Full-Flow Condensate Demineralizer System

The Full-Flow Condensate Demineralizer System consisted of resin-filled service tanks that removed ionic impurities from the condensate water going back to the reactor. All tanks and piping have been removed.

3.2.2.19. Steam Turbine

The turbine was a high pressure, condensing, reaction, tandem compound, reheat 3600 rpm unit rated at 60 MW. The turbine consisted of a high pressure and intermediate pressure and a low-pressure element. The Steam Turbine, as well as some steam system piping and components have been removed.

3.2.2.20. 60-Megawatt Generator

The 60 MW generator was a high-speed, turbine-driven wound-rotor machine rated at 76,800 kVA. The generator was cooled by a hydrogen system, lubricated by a forced-flow lubricating system, and excited by a separate exciter attached to the end of the generator shaft through a reduction gear. The main and reserve exciters have been removed. The generator has been completely removed, unconditionally released and dispositioned.

3.2.2.21. Turbine Oil and Hydrogen Seal Oil System

The Turbine Oil System received cooled oil from the lube oil coolers to supply the necessary lubricating and cooling oil to the turbine and generator bearings, exciter bearings, and exciter reduction gear. This system, with exception of the drained clean and dirty oil tanks, has been completely removed.

3.2.2.22. Heating, Ventilation, and Air Conditioning (HVAC) Systems

The Reactor Building Ventilation System utilized two 30 ton, 12,000 cfm air conditioning units for drawing fresh air into the building and for circulating the air throughout the building. Each air conditioning unit air inlet included a filter box assembly, face and bypass dampers, and one 337,500 Btu/hr capacity steam coil that was used when heating was required. Air entered the building through openings between and around the bi-parting door sections and was exhausted from the building using stack blowers through the exhaust stack for the facility. The stack is 350 feet high and is constructed of structural concrete with an aluminum nozzle at the top. The exhaust system was equipped with conventional and high-efficiency filters and monitored by a particulate radiation detector. A monitoring system is installed with the exhaust system, which includes an isokinetic nozzle, located downstream of the high-efficiency filters. The system, which historically has drawn air from the stack exhaust to the monitoring system, is capable of detecting particulate and gaseous activity.

Ventilation for the WTB was provided by a 2000 cfm exhaust fan that drew air from the shielded vault areas of the building and exhausted the air through a duct out the floor of the building to the gas storage tank vault. The stack blowers then exhausted the air from the gas storage tank vault through the connecting tunnel and discharged the air from the building through the stack.

Currently, both systems are de-energized. Building ventilation is currently supplied through the use of stack fans that are energized by temporary power.

3.2.2.23. Liquid Waste Collection Systems

The Liquid Waste System collects the liquid waste from the Turbine Building, the WTB, the gas storage tank vault, and the tunnel into two storage tanks (4500 gallons and 3000 gallons) located in the tunnel between the Reactor Building and the Turbine Building.

The Reactor Building Liquid Waste System, which is separate from the Liquid Waste System, consists of two retention tanks, each with a capacity of 6000 gallons, a liquid waste transfer pump, two sump pumps, and the necessary piping to route the waste liquid to and from the retention tanks.

Following processing and sampling to demonstrate compliance with the release criteria, the liquid waste from each system was then discharged to the common G-3/LACBWR circulating water discharge outflow. This was the normal liquid effluent release pathway for LACBWR.

Spent resin was transferred to the spent resin receiving tank and held until there was a sufficient quantity available for shipment to an approved processing facility. The resin was then transferred to an approved shipping container, dewatered, packaged and shipped for off-site disposal.

Currently, the liquid waste collection system pumps are not operable. The only liquid effluent discharges at LACBWR are through the East Turbine building sump using an air operated pump. The air operated pump discharges to the inlet of the liquid waste monitor, which is still operable.

3.2.2.24. Electrical Distribution System

The plant is disconnected from off-site power in support of Cold and Dark status. Currently the site has a 480 volt 500 kVa transformer providing power to multiple power carts throughout the buildings. Temporary power is tied to existing overhead cranes and power to exhaust fans for the stack.

3.2.3. Additional Activities

Other completed decommissioning activities include:

- The abatement, packaging and disposal of known and readily accessible lead and/or lead containing material.
- The abatement, packaging and disposal of known and readily accessible Asbestos Containing Material (ACM).
- The placement of all spent fuel into dry storage in the ISFSI facility and the removal of fuel racks from the FESW.
- The disconnection of LACBWR from off-site electrical power and placing LACBWR in a "Cold and Dark" status.
- The draining and removal of other miscellaneous system piping.

3.3. Future Decommissioning Activities and Tasks

The plans for the decontamination, dismantlement and anticipated end-state condition(s) for the remaining site structures are presented in the following sections. The methods to remediate contaminated structures, systems, and equipment do not involve any unique safety or remediation issues.

3.3.1. Reactor Building

The Reactor Building is a right circular cylinder building with a hemispherical dome and semi-ellipsoidal bottom. It has an overall internal height of 144 feet and an inside diameter of 60 feet, and it extends 26 feet 6 inches below grade level. The steel shell thickness is 1.16 inch, except for the upper hemispherical dome, which is 0.60 inch thick.

The building contained most of the equipment associated with the nuclear steam supply system, including the RPV and biological shielding. The interior of the shell is lined with a 9-inch-thick layer of concrete to an elevation of 727 feet 10 inches Above Mean Sea Level (AMSL). The structure is supported on a foundation consisting of concrete-steel piles and a pile capping of concrete approximately 3 feet thick.

The shell includes two airlocks. The personnel airlock connects the Reactor Building to the Turbine Building. In addition, there is also an 8 feet by 10 feet freight door opening in the Reactor Building that is intended to accommodate large pieces of equipment. To facilitate RPV removal and dry cask storage, an opening was created in the Reactor Building. The opening is closed by a weather tight, insulated, roll-up, bi-parting door. The majority of pipe penetrations leaves the Reactor Building 1 to 10 feet below grade level either at the northwest quadrant or at the northeast quadrant and enters the pipe tunnel.

A 50 ton traveling polar crane with a 5 ton auxiliary hoist is located in the upper part of the Reactor Building. The bridge completely spans the building and travels on circular tracks supported by columns around the inside of the building. The lifting cables of both the 50-ton and the 5-ton hoists are also long enough to reach down through hatchways into the basement area. Hatches at several positions in the main and intermediate floors may be opened to allow passage of the cables and equipment.

The remaining components and systems in the Reactor Building will be drained, dismantled, and removed. Area preparation and set-up for commodity removal will include radiological surveys and the identification and mitigation of any hazardous material.

Systems or components will be removed utilizing mechanical means with support from the overhead crane or local hoists. Some systems or components might require hot work activities to size reduce. The systems will be either loaded into shipping containers or will be transported to the waste loading area in the Turbine Building.

Water and sludge are currently inside the OHST. The tank will be dewatered and desludged. Once the tank has been adequately characterized, a fixative will be applied in preparation for building demolition. Keeping associated piping and components in place while performing this activity will allow for the collection of any liquids. This piping will be dismantled and removed once the tank is prepared for demolition.

In preparation for the building demolition, the FESW will be dismantled from the main floor elevation. As necessary, prior to dismantlement, the FESW will be decontaminated to levels that will allow for the performance of hot work activities required to remove the stainless steel FESW liner. Associated equipment (HVAC, etc.) and piping will also be removed. Contaminated sections of the FESW liner will be size reduced using plasma cutting. Sized pieces of the FESW liner will be lifted by the overhead crane, packaged and placed in the waste staging area in the Turbine Building. Once the FESW liner has been removed, the concrete underlying the FESW will be decontaminated to the extent necessary to allow open-air demolition as specified in Energy*Solutions* Technical Support Document (TSD) RS-TD-313196-005*,* LACBWR Open Air Demolition Limits (3).

After commodity removal is complete, the basement elevation (621 foot) of the Reactor Building will be remediated to levels that will allow demolition of above ground structures in open air with proper contamination controls per Reference 3. The preparation of the Reactor Building basement will include:

- The removal of any identified Hazardous Waste.
- Asbestos Abatement (to be performed by a qualified Subcontractor).
- Dismantle and remove the 6,000-gallon retention tanks.
- Dismantle and remove the two Forced Circulation Pumps, including the inlet and outlet piping as well as the auxiliary oil pumps.
- Dismantle and remove the condensate purification ion exchangers.
- Remediation of the sump.
- The removal of any lead shielding.

The exposed concrete will then be surveyed to determine the scope of the remediation necessary to meet the open-air demolition criteria specified in Reference 3. If unacceptable contamination is identified within the first couple of inches of concrete, a scabbling method or air hammering method will be used to remove the contaminated material. If the contamination is detected at a deeper depth, then a wire saw will be used to remove contaminated areas above the limits for open air demolition. If large sections of contaminated concrete must be removed during this process, then a structural evaluation will be completed.

Once surveys have demonstrated that the open-air demolition criteria have been met, a high reach excavator equipped with a pneumatic hammer will be used to break the interior concrete walls down to grade level. After the above grade internal steel shell is exposed, it will be segmented and removed using cutting torches from the top down to the ground elevation. When the steel liner segmentation and removal of the steel liner to the ground elevation is complete, a sprung structure and associated ventilation system will be installed over the remainder of the Reactor Building. The remaining interior concrete will then be removed to the thermal shield. The thermal shield will be segmented using a wire saw into manageable pieces for special packaging as mixed waste. After the thermal shield is removed, the remainder of the interior concrete will be removed, completely exposing the steel liner. Subsequent to interior concrete removal, the remaining portion of the steel liner will be removed. Demolition debris will be loaded into appropriate containers and trucked to a rail trans-load facility in Winona, MN where the waste container will be transferred to a rail car and then shipped to the Energy*Solutions* disposal site in Clive, Utah.

The remaining structural concrete outside the liner below the 636 foot elevation (i.e., concrete "bowl" below 636 foot elevation, concrete pile cap and piles) will remain and be subjected to a Final Radiation Survey (FRS) in accordance with LTP Chapter 5.

3.3.2. Turbine Building and Turbine Office Building

The Turbine Building housed the steam turbine and generator, main condenser, electrical switchgear, and other pneumatic, mechanical and hydraulic systems and equipment. A 30-ton traveling bridge crane with a 5 ton auxiliary hoist capacity spans the Turbine Building. The crane has access to major equipment items located below the floor through numerous hatches in the main floor. The Turbine Building is 105 feet by 79 feet and 60 feet tall.

The Turbine Office Building contained offices, the Control Room, locker room facilities, laboratory, shops, counting room, personnel change room, decontamination facilities, heating, ventilating and air conditioning equipment, rest rooms, storeroom, and space for other plant services. In general, these areas were separated from power plant equipment spaces. The Turbine Office Building is 110 feet by 50 feet and 45 feet tall.

Commodity removal has begun and will continue in the Turbine Building utilizing cutting tools and mechanical means to dismantle radioactive piping and components. Band saws and reciprocating saws will be the primary methods used. System pieces and waste will be sized to meet packaging and waste disposal criteria. Waste will be packaged and stored in the waste loading area located on the ground floor in the northwest corner of the Turbine Building until it is properly shipped and disposed of at an off-site facility.

After radioactive commodity removal is complete, surveys will be performed of all remaining systems, components and structural surfaces to ensure that the open-air demolition criteria specified in Reference 3 is met. Structural materials that do not meet the open-air demolition criteria will be removed, segregated, properly packaged and disposed of as radioactive waste. As with the Reactor Containment, if unacceptable contamination is identified within the first couple of inches of concrete, a scabbling method or air hammering method will be used to remove the contaminated material. If the contamination is detected at a deeper depth, then a wire saw will be used to remove contaminated areas. All radioactive waste will be loaded and transported to an acceptable radioactive waste disposal facility, primarily the Energy*Solutions* facility in Clive, Utah. All structural decontamination activities will be performed in accordance with approved Radiation Work Permits (RWP) and under the oversight of Radiation Protection personnel.

When all structural surfaces have been decontaminated to the open-air demolition limits, the building will be demolished. All remaining systems and components, interior structural surfaces and structural concrete will be demolished to the ground level slab. The general demolition sequence within the Turbine Building will be performed from the top down and from west to east to allow open access to load out areas. Concrete will be processed to meet disposal site requirements. Misting methods will be utilized during building demolition to minimize dust. The majority of the construction debris resulting from the demolition of the structure is expected to be treated as low level radioactive waste and will be shipped to the licensed radioactive waste disposal facility. Waste will be loaded into appropriate containers and trucked to a rail trans-load facility in Winona, MN where the waste container will be transferred to a rail car and then shipped to the Energy*Solutions* disposal site in Clive, Utah. If possible, some materials including structural concrete will be radiologically surveyed and released for unrestricted use in accordance with NUREG-1575, Supplement 1, *Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual* (MARSAME) (4). Materials released for unrestricted use can be recycled or released for disposal at a non-radiological landfill. All bulk material sent for recycle or disposal at a non-radioactive disposal site will be subjected to a final assessment for the presence of any residual radioactive contamination by undergoing an aggregate survey by use of a 193-6 Micro R instrument or similar.

When the Turbine Building has been demolished, the foundation slab will be exposed. An excavator with appropriate tools (pneumatic hammer, loading bucket, etc.) will remove the building slab and foundation to meet disposal site requirements. During slab and foundation removal, underground utilities will also be removed, surveyed, packaged and properly disposed. Some examples of underground utilities might be gas, water, miscellaneous piping, and discharge line. The slab and foundation walls will be removed to a minimum depth of 3 feet below grade (636 foot elevation).

3.3.3. Waste Treatment Building, Gas Storage Tank Vault and LSA Storage Building

The WTB is located to the northeast of the Reactor Building. The building contained facilities and equipment for decontamination and the collection, processing, storage, and disposal of low level solid radioactive waste. The WTB is 34 feet by 42 feet and 20 feet tall. The WTB basement floor is at elevation 630 feet and has a 3 foot deep sump with 8 inch thick walls and a bottom which extend to a depth of 626 feet.

The grade floor of the WTB contains a shielded compartment which houses a 320 ft^3 stainless steel spent resin receiving tank and resin receiving and transfer equipment. Located outside of the shielded cubicle were two back-washable radioactive liquid waste filters and dewatering piping, containers, and pumps. The main floor of the WTB also housed a decontamination facility, consisting of a steam cleaning booth, a decontamination sink, and heating/ventilation/air conditioning units.

The basement of the WTB consists of two shielded cubicles. One cubicle, to which access is gained by removal of floor shield plugs, was used for the storage of high activity solid waste drums. The other area, to which access is gained by a stairway, contains the dewatering ion exchanger, the WTB sump and pump, and additional waste storage space.

The Gas Storage Tank Vault (GSTV) is a 29 foot by 31 foot underground concrete structure with 14 feet high walls and 2 feet thick floors, walls, and ceiling located below ground just outside of the WTB. The vault is 3 feet below grade with a sump that extends to a depth of 22 feet or elevation 617 feet. The Gas Decay System routed main condenser gases through various components for drying, filtering, recombining, monitoring and holdup for decay. Two 1,600 cubic feet tanks are located in the GSTV. The tanks had the capability to store radioactive gases until such time that they were batch released via the stack. The tanks remain in place along with some associated piping. The remainder of the Gas Decay system has been removed.

The Low Specific Activity (LSA) Storage Building is located southwest of the Turbine Building. It was used to store processed, packaged and sealed low level dry active waste materials, and sealed low level activity components. No liquid wastes were stored in this building. The LSA Building is 27 feet by 80 feet and 15 feet tall.

Commodity removal has begun and will continue in the WTB, GSTV and LSA Building utilizing cutting tools and mechanical means to dismantle radioactive piping and components. Band saws and reciprocating saws will be the primary methods used. The interiors of tanks will be cleaned and a fixative will be applied prior to dismantlement. System pieces and waste will be sized to meet packaging and waste disposal criteria. Waste will be packaged and stored in the waste loading area in the Turbine Building until it is properly shipped and disposed of at an off-site facility.

After commodity removal is complete, the interior concrete surfaces will be remediated to the open air demolition criteria per Reference 3. Structural material that does not meet the open-air demolition criteria will be removed, segregated, packaged and disposed of as radioactive waste. If unacceptable contamination is identified within the first couple of inches of concrete, a scabbling method or air hammering method will be used to remove the contaminated material. If the contamination is detected at a deeper depth, then a wire saw will be used to remove contaminated areas. All radioactive waste will be loaded and transported to an acceptable radioactive waste disposal facility.

When all structural surfaces have been decontaminated to the open-air demolition criteria, the above grade portions of each building will be demolished. The entire LSA building, including the concrete floor slab will be removed. The remaining structural concrete for the WTB and GSTV located below 636 foot elevation will remain and be subjected to a FRS in accordance with Chapter 5. Concrete will be processed to meet disposal site requirements. Misting methods will be utilized during building demolition to minimize dust. All construction debris resulting from the demolition of each of the structure will be treated as low-level radioactive waste and will be shipped to the licensed radioactive waste disposal facility. Waste will be loaded into appropriate containers and trucked to a rail trans-load facility in Winona, MN where the waste container will be transferred to a rail car and then shipped to the Energy*Solutions* disposal site in Clive, Utah.

3.3.4. LACBWR Crib House

The LACBWR Crib House is located on the bank of the Mississippi River to the west of the plant. The structure served as the intake for the Circulating Water System, which provided cooling water to various LACBWR plant systems. The LACBWR Crib House contains the diesel-driven high pressure service water pumps, low pressure service water pumps and the circulating water pumps. The LACBWR Crib House is 35 feet by 45 feet and 15 feet tall.

In addition to the G-3 Crib House, the LACBWR Crib House also currently serves the active G-3 facility, and consequently, will remain intact and undisturbed by the decommissioning process. Radiological surveys, either FSS or MARSAME free release surveys will be performed on the interior and exterior structural surface and systems of the LACBWR Crib House to demonstrate that the structure can be released for unrestricted use.

3.3.5. Maintenance Eat Shack and 1B Diesel Generator Building

The Maintenance Eat Shack is a 20 feet by 40 feet and 15 feet tall steel-sided building with windows constructed over a concrete slab.

The 1B Diesel Generator Building is attached to the southeast corner of the Turbine Building and contains the Electrical Equipment Room, Diesel Generator Room, and an empty Battery Room. The building is constructed of concrete block and steel beams and braces. The building is L-shaped having largest dimensions of 31 feet by 38 feet and 13 feet tall.

These two structures will be radiologically characterized and then completely demolished, including the concrete foundation slabs. Construction debris resulting from the demolition of these structures will be treated as low-level radioactive waste and will be shipped to the licensed radioactive waste disposal facility. Waste will be loaded into appropriate containers and trucked to a rail trans-load facility in Winona, MN where the waste container will be transferred to a rail car and then shipped to the Energy*Solutions* disposal site in Clive, Utah. If possible, some materials, including structural concrete will be radiologically surveyed and released for unrestricted use in accordance with MARSAME. Materials released for unrestricted use can be recycled or released for disposal at a non-radiological landfill. All bulk material sent for recycle or disposal at a non-radioactive disposal site will be subjected to a final assessment for the presence of any residual radioactive contamination by undergoing an aggregate survey by use of a 193-6 Micro R instrument or similar.

3.3.6. Ventilation Stack

The LACBWR Ventilation Stack is a 350 feet high, tapered, reinforced concrete structure with an outside diameter of 7 feet at the top and 25 feet at the base. The wall thickness varies from 15 inches at the bottom to 6 inches at the top. The 4 feet thick foundation mat rests on a pile cluster of 78 piles. The foundation mat is 40 foot square concrete base formed without triangular sides on the southeast and southwest corners.

The Ventilation Stack will be radiologically characterized and then completely demolished. Once characterization is complete, interior concrete surfaces will be remediated to open air demolition criteria per Reference 3 and demolished. If remediation is not practicable, then a fixative will be applied to the identified surfaces to mitigate any loose contamination.

Demolition will be performed from the top down. It is anticipated that a traveling scaffold system will be employed to provide access to the exterior of the stack. The stack will be removed using mechanical hand tools down to the lower 40 foot elevation. The bottom 40 feet of the ventilation stack will be removed with excavators and pneumatic breakers. The excavators will saw and break the concrete into manageable sections and drop the sections into the interior of stack. An opening at the bottom of the stack will be made to allow the removal of the concrete debris. The concrete foundation mat will be taken down to 3 feet below grade. Wet methods will be utilized during all demolition to minimize dust. Project personal will monitor and barricade the fall zones in the vicinity of the ventilation stack. All construction debris resulting from the demolition of these structures will be treated as low-level radioactive waste and will be shipped to the licensed radioactive waste disposal facility. Waste will be loaded into appropriate containers and trucked to a rail trans-load facility in Winona, MN where the waste container will be transferred to a rail car and then shipped to the Energy*Solutions* disposal site in Clive, Utah.

3.3.7. Legacy Waste

Approximately 75 cubic yards of stockpiled deconstruction debris is stored inside the south LACBWR Site Enclosure (LSE) fence line. The debris consisting of asphalt removed from roads inside the LSE, the underlayment sand from the roads and concrete debris from the removal of part of a wall in the Turbine Building. All of the stockpiled deconstruction debris will be processed as low-level radioactive waste during decommissioning.

3.4. <u>Radiological Impacts of Decommissioning Activities</u>

The decommissioning activities described are and will be conducted under the provisions of the Solutions Radiation Protection Program and Radioactive Waste Management Program. These programs are and will continue to be implemented as described in the D-Plan/PSDAR. The Solutions Radiation Protection Program and written site procedures are intended to provide sufficient information to demonstrate that decommissioning activities will be performed in accordance with 10 CFR 19, *Notices, Instructions And Reports To Workers*, 10 CFR 20, *Standards For Protection Against Radiation* and to maintain radiation exposures As Low As Reasonably Achievable (ALARA) The Solutions Radioactive Waste Management Program controls the generation, characterization, processing, handling, shipping, and disposal of radioactive waste in accordance with the approved Solutions Radiation Protection Program, and written plant procedures.

The current Radiation Protection Program, Waste Management Program, and Radiological Effluent Monitoring and *Radiological Effluent Monitoring and Offsite Dose Calculation Manual* (ODCM) (5) will be used to protect the workers and the public, as applicable, during the various decontamination and decommissioning activities. These well-established programs are routinely inspected by the Nuclear Regulatory Commission (NRC) to ensure that workers, the public, and the environment are protected during facility decommissioning activities. It is also important to note that decommissioning activities involve the same radiation protection and waste management considerations as those encountered during plant operations, maintenance and outages, and decommissioning activities conducted to date. There are no additional procedures for which approval is being sought in this LTP. As described in the D-Plan/PSDAR, the decommissioning will be accomplished with no significant adverse environmental impacts in that:

- No site-specific factors pertaining to the decommissioning of the LACBWR would alter the conclusions presented in NUREG-0586 (see LTP Chapter 8).
- Radiation dose to the public will be minimal.
- Decommissioning is not an imminent health or safety concern and will generally have a positive environmental impact.

Continued application of the current and future Radiation Protection and Radiological Effluent Monitoring Programs at LACBWR ensures public protection in accordance with 10 CFR 20 and 10 CFR 50, Appendix I. Radiological Environmental Monitoring Program (REMP) reports for LACBWR to date conclude that the public exposure as a result of decommissioning activities is bounded by the evaluation in NUREG-0586, which concludes the impact is minimal.

3.4.1. Control Mechanisms to Mitigate the Recontamination of Remediated Areas

Due to the large scope of remaining structures and systems that will be decontaminated and dismantled, FRS of areas may be performed in parallel with decommissioning activities. Consequently, a systematic approach will be employed to ensure that areas are adequately remediated prior to performing FRS and ongoing decommissioning activities do not impact the radiological condition of areas where compliance with the unrestricted release criteria as specified in 10 CFR 20.1402 has been demonstrated. These measures and mechanisms are described in LTP Chapter 5.

3.4.2. Occupational Exposure

Table 3-2 provides the cumulative site dose estimates for the decommissioning of LACBWR. This dose estimate is documented in Energy*Solutions* TSD RS-TD-313196-007, *Radiation Exposure Projections for LACBWR Decommissioning* (6). This information is in addition to information gathered for reporting of yearly site dose. The total radiation exposure estimate for remaining decommissioning activities is estimated to be approximately 130.3 person-rem.

Table 3-2 Radiation Exposure Projections for Decommissioning

Activity	Exposure (person-rem)
Decommissioning Activity	
Asbestos and other Hazardous Material Abatement	18.6
Reactor Building	81.4
Waste Treatment Building	9.6
Turbine Building	1.6
Remaining Structures	0.8
Waste Processing (includes shipping and prep)	18.2
Total for Decommissioning Activities	**130.3**

3.4.3. Exposure to the Public

Continued application of Solutions' Radiation Protection, Radioactive Waste, Radiological Effluent Technical Specification and Radiological Environmental Monitoring Program assures public protection in accordance with 10 CFR 20 and 10 CFR 50, Appendix I.

3.4.4. Radioactive Waste Projections

The Radioactive Waste Management Program is used to control the characterization, generation, processing, handling, shipping, and disposal of radioactive waste during decommissioning. Activated and contaminated systems, structures, and components represent the largest volume of low level radioactive waste expected to be generated during decommissioning. Other forms of waste generated during decommissioning include:

- Contaminated water;
- Used disposable protective clothing;
- Expended abrasive and absorbent materials;
- Expended resins and filters;
- Contamination control materials (e.g., strippable coatings, plastic enclosures); and
- Contaminated equipment used in the decommissioning process.

Table 3-3 provides projections of waste classifications and quantities that will be generated by the decommissioning of LACBWR. As Solutions has elected to use an approach commonly referred to as "rip & ship" verses performing significant on-site decontamination activities, the total volume of low-level radioactive waste for disposal has been estimated at 393,696 cubic feet. Actual waste volumes and classifications may vary. The vast majority of this waste will be shipped to the licensed Energy*Solutions* radioactive waste disposal facility in Clive, Utah.

Table 3-3 Projected Waste Quantities

WASTE TYPE	WASTE CLASS	WASTE WEIGHT (lbs.)	PACKING DENSITY (lb./ft^3)	WASTE VOLUME (ft^3)
Debris: Concrete	A	20,026,177	85	235,603
Debris: Rebar	A	889,249	85	10,463
Debris: Metal	A	1,827,476	30	60,916
Asphalt	A	541,575	50	10,832
Soils	A	2,8777,268	74	38,882
Asbestos	A	300,776	17	17,693
Dry Active Waste (DAW)	A	30,880	12	2,574
Mixed Waste	A	56,222	110	16,733
			Total Estimated Volume	393,696

Table 3–3 Continued

WASTE TYPE	WASTE CLASS	WASTE WEIGHT (lbs.)	PACKING DENSITY (lb./ft^3)	WASTE VOLUME (ft^3)
Clean Backfill – (Debris to Landfill)	Clean Debris	19,747,211	75	263,297
Clean Asphalt Disposal	Clean Debris	4,874,175	50	97,484
Recycle - Metals	Scrap Metal	1,803,064	20	90,154
Recycle - Rebar	Scrap Metal	954,659	30	31,822
			Total Estimated Volume	482,757

3.4.5. Project Milestones

Table 3-4 lists the current schedule for the remaining decommissioning activities.

Table 3-4 General Project Milestones

Date	Milestone
Q2/2016	Submit LTP to NRC
Q2/2016	License Transfer Complete
Q2/2016	Mobilization Complete
Q3/2016	Stack Demolition Complete
Q3/2017	LTP Approval by NRC
Q3/2017	Component Removal Complete
Q4/2017	Building Demolition Complete
Q4/2018	Transportation and Disposal Complete
Q4/2018	Site Remediation Complete
Q4/2018	FRS Complete

Table 3-4 Continued

Date	Milestone
Q1/2019	Site Restoration Complete
Q1/2019	Submit Remaining FRS Reports
Q1/2019	Submit License Transfer to Dairyland Amendment Request to NRC
Q1/2020	License Transfer to Dairyland Approved by NRC
Q1/2020	LACBWR License Termination Approval by NRC

Note: Circumstances can change during decommissioning. If Solutions determines that the decommissioning cannot be completed as outlined in this schedule, Solutions will provide an updated schedule to the NRC.

3.5. <u>References</u>

1. Dairyland Power Cooperative, LACBWR Decommissioning Plan and Post Shutdown Decommissioning Activities Report (D-Plan/PSDAR), Revision – March 2014.
2. U.S. Nuclear Regulatory Commission NUREG-0586, Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities, Supplement 1, Volume 1 – November 2002.
3. EnergySolutions Technical Support Document RS-TD-313196-005, La Crosse Open Air Demolition Limits.
4. U.S. Nuclear Regulatory Commission NUREG-1575, Supplement 1, Multi-Agency Radiation Survey and Assessment of Materials and Equipment Manual (MARSAME) – December 2006.
5. Radiological Effluent Monitoring and Offsite Dose Calculation Manual (ODCM).
6. EnergySolutions Technical Support Document, RS-TD-313196-007, Radiation Exposure Projections for LACBWR Decommissioning.