

3.0 ESTIMATE OF EXPECTED DECOMMISSIONING COSTS

3.1. INTRODUCTION

The revised decommissioning cost estimate prepared by Solutions evaluates the following cost elements:

1. Cost assumptions used, including contingency factors;
2. Major decommissioning activities and tasks;
3. Unit cost factors;
4. Estimated costs for decontamination and removal of equipment and structures;
5. Estimated costs for waste disposal, including disposal site surcharges;
6. Estimated Final Radiation Survey (FRS) costs; and
7. Estimated total costs.

The cost estimate focuses on the remaining work, including costs of labor, materials, equipment, energy, and services. The cost estimate includes the cost of the planned remediation activities as well as the cost of the transportation and disposal of the waste generated by the planned work.

3.2. HISTORICAL PERSPECTIVE

The LACBWR Decommissioning Plan was approved on August 7, 1991. Because the licensing history of LACBWR spans a period that includes several decommissioning regulation changes, The D-Plan has been revised to the LACBWR Decommissioning Plan and Post-Shutdown Decommissioning Activities Report (D-Plan/PSDAR).

In a letter dated October 8, 2015 (Reference 1), Dairyland and LaCrosseSolutions, LLC (Solutions) requested Nuclear Regulatory Commission (NRC) consent to transfer Dairyland's possession, maintenance and decommissioning authorities, under Possession Only License No. DPR-45, from Dairyland to Solutions. The NRC approved this transfer in a letter dated May 20, 2016 (Reference 2). The revised cost estimates presented reflect those developed by Solutions.

After the balance of the site is remediated and the as-left radiological conditions are demonstrated to be below the unrestricted use criteria specified in 10 CFR 20.1402, the licensed area will be reduced to a small area around the ISFSI and Possession Only License No. DPR-45 will be transferred back to Dairyland.

3.3. PREVIOUS DAIRYLAND COST ESTIMATES

In late 1983, the DPC Board of Directors resolved to provide resources for the final dismantlement of LACBWR. DPC began making deposits to a decommissioning fund in 1984. The Nuclear Decommissioning Trust (NDT) was established in July 1990 as an external fund outside DPC's administrative control holding fixed income and equity investments.

The cost of DECON was based on the selection of unrestricted use as the criteria to be pursued for LACBWR. At the time of preparation of this plan in 1987, decommissioning cost was based on studies by Nuclear Energy Services, Inc., available generic decommissioning cost guidance, and technology as it existed. In the Safety Evaluation Report dated August 7, 1991 (Reference 3), related to the order authorizing decommissioning and approval of the Decommissioning Plan, the NRC found the estimate of \$92 million in Year 2010 dollars reasonable for the final dismantling cost of LACBWR.

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An improved site-specific decommissioning cost study was performed by Sargent & Lundy (S&L) in 1994 and provided basis for the updated cost estimate and funding. The S&L study determined the cost to complete decommissioning to be \$83.4 million in Year 1994 dollars with commencement of decommissioning assumed to occur in 2019. A cost study revision completed in July 1998 placed the cost to complete decommissioning at \$98.7 million in Year 1998 dollars. A cost study revision, prompted by significant changes in radioactive waste burial costs, as well as lessons learned on decontamination factors and methods, was prepared in November 2000 and placed the cost to complete decommissioning at \$79.2 million in Year 2000 dollars. During 2003, the cost study was revisited again to include changes in escalation rates, progress in limited dismantlement, and a revised reactor vessel weight definition. This update placed the cost to complete decommissioning at \$79.5 million in Year 2003 dollars.

In preparation for removal of the reactor pressure vessel (RPV), cost figures were brought current to \$84.6 million in Year 2005 dollars. As of December 2006, NDT funds were approximately \$83.4 million. NDT funds for B/C waste and RPV removals, approved by the Board of Directors, have been drawn in the amount of \$18.2 million. Following B/C waste and RPV disposal a revision to the cost estimate was performed in September 2007 that placed the cost to complete decommissioning at \$62.5 million in Year 2007 dollars.

A cost study update was completed in November 2010 to more accurately assess future costs of the remaining dismantlement needed and to facilitate DPC decommissioning and license termination planning. This update placed the cost to complete decommissioning at \$67.8 million in Year 2010 dollars. During this process, ISFSI decommissioning costs were identified uniquely as a specific item and estimated to be \$1.6 million in Year 2010 dollars. The DPC Board of Directors established an external funding mechanism for ISFSI decommissioning costs in accordance with 10 CFR 72.30 to assure adequate funds will be available for the final decommissioning cost of the LACBWR ISFSI.

A cost study update was completed in March 2013 for the LACBWR plant. During the revision to the cost study, some potentially contaminated structures previously assumed to be decontaminated and left intact were evaluated for demolition and disposal. This change in decommissioning methodology to demolition and disposal of structures, in lieu of decontamination of structures, resulted in an increase in the LACBWR plant decommissioning cost estimate in the range of \$20 million over the previous November 2010 decommissioning cost estimate of \$67.8 million. The March 2013 cost study update included the cost of demolition and disposal of the LACBWR stack, Turbine and Turbine Office Buildings, Waste Treatment Building, and Underground Gas Storage Tank Vault structure. This update placed the cost to complete plant decommissioning at \$90.7 million in Year 2013 dollars. The DPC Board of Directors formally adopted the change in decommissioning methodology to demolition and disposal of potentially contaminated structures and authorized adjustments to decommissioning funding be made as necessary.

The ISFSI Decommissioning Cost Estimate was revised in March 2013 to reflect the MPC-LACBWR as-built vertical concrete cask (VCC) dimensions. These VCC dimensions differ from those used to establish the ISFSI Decommissioning Cost Estimate in 2010. Use of the as-built VCC dimensions resulted in a reduction in the volume of concrete to be disposed of. The cost for ISFSI decommissioning was estimated to be \$1,435,626 in Year 2013 dollars.

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3.4. SOLUTIONS DECOMMISSIONING COST ESTIMATE

The decommissioning cost estimate presented herein represents the projected costs to complete the remaining decommissioning work as of October 1, 2015. This estimate was prepared by SOLUTIONS based upon an assessment of the remaining work and incorporating experience gained while performing similar decommissioning tasks including the ongoing decommissioning of the Zion Nuclear Power Station (ZNPS) through the work of its subsidiary ZionSolutions LLC.

The decommissioning cost estimate includes application of contingency, as specific provision for unforeseeable elements of cost within the defined project scope. Contingencies are particularly important where previous experience has shown that unforeseeable events, which may increase costs, are likely to occur. The contingency, as used in this estimate, does not account for price escalation and inflation in the costs of decommissioning over the remaining project duration.

The site-specific decommissioning cost estimate presents a breakdown of all costs associated with completing the decommissioning and unrestricted release of the LACBWR site, other than the area bounded by the ISFSI. The estimate includes the costs required to accomplish unrestricted release and restore the site to a safe and stable condition as well as the operation of the ISFSI until the site and the remaining ISFSI are transferred back to Dairyland.

3.5. COST ESTIMATE DESCRIPTION AND METHODOLOGY

The cost estimates include consideration of regulatory requirements, contingency for unknown or uncertain conditions, and the availability of low and high-level radioactive waste disposal sites. The methodology utilized to develop the cost estimate follows the basic approach presented in "Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates, (Reference 4)" which uses a unit cost factor approach for estimating the decommissioning activity costs. It also includes the use of site specific information when available (e.g., hourly labor rates, and commodities).

The updated DPC estimate completed in March 2013 has been utilized to obtain site-specific commodity quantities for this estimate. The commodity weights and estimated unit cost factors were applied, which take into consideration the current decommissioning approach and schedule, to arrive at an updated cost estimated to decommission LACBWR. Dairyland and Solutions also utilized 25 years of corporate experience in planning and scheduling as well as the latest available industry experience (e.g., information from the decommissioning of ZNPS).

The estimate does not include the transfer of spent fuel, which has been previously transferred to an ISFSI facility, the security costs for the ISFSI facility, or the removal of certain large components and decommissioning work previously completed.

Additionally, Dairyland and Solutions performed a contingency and risk analysis so that the potential additional costs due to expected but undefined risks and uncertainties could be addressed and included in the cost estimate.

The resulting information was then compiled into a decommissioning cost estimate. The following sections provide a summary of those results.

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3.6. SUMMARY OF THE SITE-SPECIFIC DECOMMISSIONING COST ESTIMATE

The overall remaining decommissioning cost (including scope risk contingency) is estimated to be \$█ Million (in current year dollars), with a base estimated cost of \$█ Million, plus a scope risk contingency of \$█ Million. The cost estimates include provisions for cost escalation based upon the following assumptions:

- All estimated costs including labor, staff, materials, equipment, professional services, waste transportation and disposal are in 2015 dollars.
- Although all costs are in current year dollars, the project baseline does include provisions to escalate costs based on the Consumer Price Index for all Urban Customers – U.S. City Average All Items, Not Seasonally Adjusted (CPI-U NSA).
- The associated Class A radioactive waste management costs are covered by existing fixed-price contracts with EnergySolutions. Therefore, the waste management costs for these items are well known and not likely to vary due to waste volume uncertainties.
- No costs for Class B/C waste are included in the estimate, as all materials classified as B/C waste were previously removed by Dairyland.

The cost estimate includes the costs for radiological decommissioning and site restoration. A summary of the cost for each part of the decommissioning program is provided in Table 3-1.

Table 3-1 Cost Summary for Radiological Decommissioning and Site Restoration

	Radiological Decommissioning	Site Restoration¹	Total Project
Performance Baseline	\$█ Million	\$2.6 Million	\$█ Million
Contingency	\$█ Million	\$0.3 Million	\$█ Million
Total	\$█ Million	\$2.9 Million	\$█ Million

Note 1: Site restoration is included for completeness, but not required for license termination funding purposes.

3.7. ISFSI MANAGEMENT

All spent nuclear fuel elements from LACBWR have been transferred from the FESW to dry cask storage in the ISFSI. Solutions will assume responsibility for the ISFSI Site, including security requirements. Solutions has entered into a “Company Services Agreement” with Dairyland, pursuant to which Dairyland will provide operations, maintenance, access control, and security services to and for the ISFSI site. Dairyland is responsible for the costs relating to the ISFSI and those costs are not included in this decommissioning estimate.

3.8. SITE RESTORATION COSTS

Solutions acknowledges that the costs to restore the LACBWR property are not considered by the NRC staff as part of decommissioning costs. Nevertheless, there is significant interest by many stakeholders in these costs and they are presented herein. The estimated cost for the

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anticipated work scope is \$2.6 Million. A contingency of \$0.3 Million is estimated, bringing the total cost to \$2.9 Million.

Overall, that work scope includes removal of any remaining hazardous materials, demolition of remaining structures, backfilling of any open excavations or void spaces, and final grading and stabilization against erosion. The estimated costs include the labor, equipment, materials, professional services and fees needed to conduct the work. In general, most of this work is anticipated to be performed by contractors however, the estimated cost also includes all of the program support activities and services necessary to manage and safely carry out the work.

3.9. DECOMMISSIONING FUND

Decommissioning costs will be paid for with funds from the site's Nuclear Decommissioning Trust (NDT) fund. The decommissioning of the LACBWR site ISFSI will be undertaken by Solutions and will be financed separately to the NDT account amount identified here for decommissioning of the LACBWR site.

The project cash balance of the NDT identified for the decommissioning of the LACBWR site, as agreed to by Solutions, and held in trust by the Owner trustee as of October 1, 2015 was \$■■■■ Million.

Based on a time phased cash flow analysis of the radiological decommissioning and site restoration costs, and assuming NDT returns at an annual 2% real, after tax rate of return, the required minimum funding assurance amount to fund the future radiological decommissioning costs equals \$■■■■ Million, which is below the \$■■■■ Million available balance described above.

This NDT position, together with the \$■■■■ Million Surety Bond payable to the NDT, provides for sufficient funding and financial assurance for the completion of the decommissioning of the LACBWR site.

Additionally, although not relied upon here, Solutions parent EnergySolutions has agreed with Dairyland to provide a performance guaranty defined in the LACBWR Decommissioning Agreement submitted as part of the license transfer application.

This PSDAR will not be updated for minor changes in anticipated decommissioning costs. However, the status of the decommissioning funding will continue to be reported to the NRC in accordance with 10 CFR 50.75(f)(1), "Reporting and recordkeeping for decommissioning planning." Additionally, Solutions will inform the NRC in writing of any significant schedule and decommissioning cost changes per 10 CFR 50.82(a)(7), and provide an updated site-specific estimate of remaining decommissioning costs with the license termination plan per 10 CFR 50.82(a)(9)(ii)(F).

3.10. REFERENCES

1. Letter from Dairyland Power Cooperative to the Nuclear Regulatory Commission, for Order Approving License Transfer and Conforming Administrative License Amendments, dated October 8, 2015.
2. Marlayna Vaaler, U.S. Nuclear Regulatory Commission, Letter to Barbara Nick, Dairyland Power Cooperative, "Order Approving Transfer of License for the La Crosse

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Boiling Water Reactor from the Dairyland Power Cooperative to LaCrosseSolutions, LLC and Conforming Administrative License Amendment” dated May 20, 2016

3. Letter from the Nuclear Regulatory Commission to Dairyand Power Cooperative, Order to Authorize Decommissioning and Amendment No. 66 to Possession Only License No. DPR-45 for La Crosse Boiling Water Reactor, dated August 7, 1991
4. T.S. LaGuardia et al., Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates, AIF/NESP-036, May 1986.

4.0 PLANT POST-FUEL ACCIDENT ANALYSIS

4.1. OVERVIEW

This section presents the results of an analysis (Reference 4.8.1) of postulated accidents that reflect the significantly reduced non-ISFSI radiological source term as compared to the LACBWR source term during plant operations. With consideration for the current stage of LACBWR decommissioning and with spent nuclear fuel now stored in the ISFSI, this analysis confirms that the minimal radioactive material resulting from LACBWR operation and remaining on the LACBWR site is insufficient for any potential event to result in exceeding dose limits or otherwise involving a significant adverse effect on public health and safety.

The analysis considers the spontaneous release of the (non-ISFSI-related) radioactive source term that was remaining at the LACBWR site in 2012. Decommissioning activities and the associated decontamination subsequent to 2012 have significantly reduced that source term such that the analysis presented here remains bounding for future activities. The 2012 source term is in a form and quantity immediately releasable through the:

- Airborne pathway; and
- Liquid discharge pathway.

The airborne release and one of the liquid release events considered in the analysis are non-mechanistic in that there are no credible phenomena that could reasonably be postulated to cause such releases. However, these events are analyzed and conservative assumptions for other credible liquid release events are selected to bound any remaining decommissioning events that can still be postulated considering the current stage of LACBWR decommissioning. It should be noted that the accident analysis of the original liquid release system has been retained as the bounding analysis, and is not the system currently in use. The operation and malfunctions of the temporary liquid waste system are bounded by the analysis presented here.

4.2. RADIONUCLIDE RELEASE LIMITS APPLIED IN ANALYSIS

4.2.1. Limits Applied to Postulated Airborne Release

The following regulatory limits were considered in the analysis of a postulated airborne release:

1. The limits of 10 CFR 100.11 that specify that the total radiation dose to an individual at the exclusion area boundary for two hours immediately following onset of a postulated fission product release shall not exceed 25 rem (whole body) and 300 rem (thyroid; see Section 4.3.2.6).
2. The EPA protective action guidelines (PAGs – Reference 4.8.2) that specify the potential offsite dose levels at which actions should be taken to protect the health and safety of the public. The EPA PAG limits include a total effective dose equivalent (TEDE) of 1 rem.

The EPA PAGs are limiting values for the LACBWR post-fuel accident analysis. This conclusion is based on the sum of the effective dose equivalent resulting from exposure to external sources and from the committed effective dose equivalent incurred from the significant inhalation pathways during the early phase of an event. As detailed further in Section 4.4, this analysis demonstrates that there is insufficient releasable radioactive contamination remaining

on the LACBWR site for reasonably conceivable radiological accident scenarios that could result in exceeding the EPA PAGs.