WILLIAM L. BERG
President and CEO

DAIRYLAND POWER
COOPERATIVE

January 14, 2009

In reply, please refer to LAC-14057

DOCKET NO. 50-409

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: Dairyland Power Cooperative
La Crosse Boiling Water Reactor (LACBWR)
Possession-Only License DPR-45
Annual Decommissioning Plan: Revised December 2008

REFERENCES:
(1) DPC Letter, Taylor to Document Control Desk, LAC-12460, dated December 21, 1987 (original submittal of LACBWR's Decommissioning Plan)
(2) NRC Letter, Erickson to Berg, dated August 7, 1991, issuing Order to Authorize Decommissioning of LACBWR
(3) NRC Letter, Brown to Berg, dated September 15, 1994, modifying Decommissioning Order

The annual update of the LACBWR Decommissioning Plan has been completed, and the pages with changes and their explanations are included with this letter. Each page with a change will have a bar in the right-hand margin to designate the location of the change. None of the changes was determined to require prior NRC approval, and they have been reviewed by both the plant Operations Review Committee and the independent Safety Review Committee.

The individual pages requiring revision are enclosed with this letter. Please substitute these revised pages in your copy(ies) of the LACBWR Decommissioning Plan. Reasons for the changes are listed on a separate enclosure.

If you have any questions concerning any of these changes, please contact Jeff Mc Rill of my staff at 608-689-4202.

Sincerely,

DAIRYLAND POWER COOPERATIVE

William L. Berg

William L. Berg, President & CEO

WLB:JBM:two
Enclosures
cc: Kristina Banovac, NRC Project Manager

HMSS01

A Touchstone Energy® Cooperative

DAIRYLAND POWER
COOPERATIVE

TO: NRC Washington – Doc Control CONTROLLED DISTRIBUTION NO. 53
(TWO COPIES)

FROM: LACBWR Plant Manager 1/14/2009

SUBJECT: Changes to LACBWR Controlling Documents

I. The following documents have been revised:

DECOMMISSIONING PLAN, revised December 2008

Remove and replace the following pages:

Cover Page
Pages 0-1 thru 0-7,
Pages 5-1 thru 5-31
Pages 6-1 thru 6-20
Figure 6.1
Pages 8-1 thru 8-3, and 8-6
Pages 9-2 thru 9-4
Pages 9-7 thru 9-9
Pages 10-1 thru 10-3

SITE CHARACTERIZATION SURVEY

Remove and replace the following pages:

Cover Page
Pages 24 thru 28

☒ The material listed above is transmitted herewith. Please verify receipt of all listed material, destroy superseded material, and sign below to acknowledge receipt.

☐ The material listed above has been placed in your binder.

☐ Please review listed material, notify your personnel of changes, and sign below to acknowledge your review and notification of personnel. [To be checked for supervisors for department specific procedures and LACBWR Technical Specifications.]

☐ The material listed above has been changed. [To be checked for supervisors when materials applicable to other departments are issued to them.]

/S/______________________________ DATE____________________

Please return this notification to the LACBWR Secretary within ten (10) working days.

A Touchstone Energy® Cooperative

La Crosse Boiling Water Reactor (LACBWR) • S4601 State Highway 35 • Genoa, WI 54632-8846 • 608-689-2331 • 608-689-4200 fax

2008 LACBWR Decommissioning Plan Review

NOTE: ***Changes described following are as they appear in 2008 D-Plan pages as revised.***

Cover Page	Update revision date.
Page 0-1 Through Page 07	Table of Contents: Listing is revised to include topics to the third level subheading. This level of detail was added to incorporate into the Table of Contents an index of systems. Minor formatting changes were also added.
Page 5-1 Through Page 5-31	Section 5., Plant Status: Entire section has been revised to reduce unused white space. Previously, section contained 45 pages. By condensing text and shifting page contents, section has been reduced by 14 pages. All pages of Section 5 are being re-issued.
Page 5-1	Section 5.1, Fuel Inventory: Section title is renamed to ***5.1, Spent Fuel Inventory***, and subheading *5.1.1, Spent Fuel* is deleted as redundant and unnecessary.
Page 5-12	Section 5.2.16, Well Water System: Second paragraph is revised by deletion of redundant information and description of equipment abandoned or removed.
Page 5-14	Section 5.2.20, Low Pressure Service Water System: Description of LPSW pumps is shortened following replacement of both pumps and motors. New units are 500-gpm and 600-gpm pumps with 25-hp and 40-hp 480-V AC motors. New pumps do not require seal water flow allowing the LPSW Seal Water System to be abandoned and eventually removed.
Page 5-18	Section 5.2.28, Turbine Oil and Hydrogen Seal Oil System: System status is updated to reflect removal.
Page 5-28 And Page 5-29	Section 5.4.2, System Radiation Levels: In the listing of survey point dose rates, current dose rates are updated to 2008 values and reflect removal of north bio-shield wall in the Reactor Building. Survey data for points 41-45 associated with FESW equipment show an increase due to the disturbance in the pool caused by the crushing, shearing, and removal of 97 fuel shrouds, 10 control rods, and two start-up sources. Recent survey point values show that the FESW system is slowly cleaning up as has been customary in the past following pool disturbances from fuel handling and other work while LACBWR was operating.
Page 6-1 Through Page 6-20	Section 6., Decommissioning Program: All pages of Section 6 are being re-issued due to revisions causing page content shifts.
Page 6-1	Section 6.1, Objectives: Stated goals of the Decommissioning Program, largely unchanged from 1987, are revisited and updated.

Page 6-1 Through Page 6-3

Section 6.2, Organization and Responsibilities: This section has been revised to describe a modified and improved LACBWR organization. Responsibilities of Plant Manager are revised to reflect recent organizational changes at LACBWR. Day to day cognizance of the Operations Department and craft maintenance groups has been assigned to senior supervisory personnel. The Plant Manager will perform the duties of the Security Supervisor, a function which previously was a collateral duty of an Operations Shift Supervisor. The Security Force Commander, a Project Manager with Securitas Security Services, Inc., will continue to provide Security Force direct supervision. This individual, with assistance from LACBWR staff, administers the Security Program in accordance with approved procedures. These changes are being done to more efficiently utilize LACBWR supervisors in the performance of upcoming project activities. The Plant Manager will maintain overall responsibility for managing the LACBWR facility and all personnel assigned to it. Internal plant organizational reporting relationship changes will facilitate work accomplishment and improve personnel management effectiveness. The irrelevant phrase, *"... and any other responsibilities which may come to light in long term SAFSTOR operation,"* has been deleted from the description of the Plant Manager's responsibilities. In numerous instances and varying forms, *insure* is corrected to ***ensure*** throughout section.

A description of the position, ***Operations, Training/Relief Supervisor***, has been added. This individual will directly supervise the Operations Shift Supervisors and will have responsibility for ensuring safe operation of the facility. This supervisor will coordinate required testing, provide test data sheet review, and implement the LACBWR Training Program. This supervisor will also provide final review and closure for the maintenance request process.

In the description of the responsibilities of the Operators, the sentence, *"The Operators will tour the facility and insure the fuel storage well and its fuel, as well as supporting systems are in a clean, operable mode,"* has been revised to state, *"The Operators will tour the facility and **ensure** that the fuel **element** storage well **and** supporting systems **are operable and the cleanliness of the facility is maintained**."* Other minor changes to paragraph are made for update and correction.

The description of the Health and Safety Supervisor is modified as ***Health and Safety/Maintenance Supervisor***. This individual will supervise crafts personnel in addition to the Health and Safety Department. Forepersons, reporting to the Health and Safety/Maintenance Supervisor, have been added to coordinate and direct activities of the Electrical, Instrument, and Mechanical Maintenance Departments. The Health and Safety Department is also staffed with a Foreperson—Health Physics.

Descriptions of the craft departments are revised by grouping order only. The description of the Administrative Assistance has been updated and revised to gender neutral. The descriptions of the Licensing Engineer, Radiation Protection Engineer, and Reactor Engineer have been revised by removing irrelevant language and adding more correct current information. ORC and SRC descriptions are likewise updated and minor changes are applied.

LACBWR organizational changes follow successful completion of the Dry Cask Storage (DCS) Quality Assurance Project Plan. As part of this effort and in concert with other DCS project development, the ALARA process has been substantially strengthened and an improved corrective action program has been implemented.

Page 6-6 Section 6.4.3.2, describing the Health Physics Technician (HP) Continuing Training Program, numerous changes are made to correct title of ***Health and Safety*** management. The title of *Health and Safety Supervisor* is modified as ***Health and Safety/Maintenance Supervisor***. The Health and Safety Department is staffed by a Foreperson—Health Physics, and Health Physics Technicians.

Page 6-9 Section 6.4.3.4, describing the Certified Fuel Handler Training Program, third paragraph of section is deleted as incorrect. DCS project activities require fuel handling. Deleted paragraph stated:

"During the SAFSTOR period, it is not expected that movements of spent fuel will be made, except for special tests or inspections to monitor the fuel in storage. At some time during the SAFSTOR period, fuel handling may be performed to transfer the spent fuel assemblies to the Department of Energy (DOE) or other entity."

Section 6.4.5, Training Program Administration and Records: The responsibility of the training program is accorded ***the Operations, Training/Relief*** *Supervisor* replacing the indefinite *LACBWR Shift Supervisor*.

Section 6.5, Quality Assurance: Minor corrections are made to improve description. Safety-related structures, systems, and components are defined in ***10 CFR 50.2***. LACBWR has no postulated potential offsite exposures comparable to the applicable guideline exposures set forth in 10 CFR 50.34(a)(1) or 10 CFR 100.11. LACBWR Quality Assurance Program Description addresses all 18 criteria of 10 CFR 50, Appendix B, but some are of a reduced scope.

Page 6-10 Section 6.6, Schedule: Second paragraph describing dismantlement effort is updated to ***2 million pounds*** of material removed as of ***November 2008***.

Page 6-11 Section 6.7, SAFSTOR Funding and Decommissioning Cost Financing: First paragraph is deleted as being irrelevant. More definitive cost funding information has been added to D-Plan previously. Deleted paragraph stated:

"DPC is currently assuming a 30-50 year SAFSTOR period. For cost estimating purposes, however, it was assumed that dismantlement commences as soon as possible, which would be shortly after the fuel is sent to a federal repository. The year 2011 was chosen as the earliest possible for DECON to commence. SAFSTOR and DECON costs are funded separately. SAFSTOR funding accommodates management of LACBWR spent fuel and provides assurance of continued funding through all modes of fuel storage prior to acceptance by the DOE. Mandated decommissioning funds will be available during the DECON period."

Page 6-12 Section 6.71 SAFSTOR Funding: Second paragraph on page is revised to update SAFSTOR funding information in relation to approved Dry Cask Storage Project now underway and not included previously.

Page 6-13 Section 6.8, Special Nuclear Material (SNM) Accountability: First paragraph has been changed to gender neutral. Second paragraph is revised for consistency and to improve description. The LACBWR ***spent fuel inventory*** is stored underwater in ***two-tiered*** storage racks within the Fuel ***Element*** Storage Well located in the Reactor Building. Third paragraph has ***10 CFR 72*** requirements added in preparation for dry cask storage.

Page 6-18 Section 6.10, Security during SAFSTOR and/or Decommissioning: In first paragraph *insure* is corrected to ***ensure***.

Section 6.11, Testing and Maintenance of SAFSTOR Systems: In second paragraph, possessive is removed twice from ***SSCs***.

Figure 6.1 Figure depicting minimum required staffing is revised to depict LACBWR organizational reporting adjustments associated with ***Operations, Training/Relief Supervisor*** and ***Health and Safety/Maintenance Supervisor***.

Page 8-1 Section 8., Health Physics: In subsections following through page 8-6, numerous changes are made to correct title of ***Health and Safety*** management and department where titled *Health Physics*. The title of *Health and Safety Supervisor* is modified as ***Health and Safety/Maintenance Supervisor***. The Health and Safety Department is staffed by a Foreperson—Health Physics, and Health Physics Technicians.

Page 8-2 Section 8.2.2, Application of ALARA: Section is revised at (1) by clarifying that Total Effective Dose Equivalent (TEDE) for each specific job and the total allowable for the year should be balanced ***for the entire operation of the facility***. In same section at (2) again clarification is added by stating an individual's TEDE dose should be balanced with TEDE dose received by ***the entire LACBWR work force including temporary DPC/contract employees to aid the overall ALARA program***, and removing the limited population and non-definitive goal contained in the phrase *other members of his/her department to the extent possible.* Item (5)

	is deleted as not applicable to the ALARA process as established. Subsequent items are renumbered.
Page 9-2 And Page 9-3	Section 9.2, Spent Fuel Handling Accident: The curie content remaining as of *October 2007* and calculated values for Whole Body Dose and Skin Dose as of *October 2007* are updated to ***October 2008***.
Page 9-4	Section 9.3, Shipping Cask or Heavy Load Drop into FESW: The curie content remaining as of *October 2007* and calculated values for Whole Body Dose and Skin Dose as of *October 2007* are updated to ***October 2008.***
Page 9-7	Section 9.8, Seismic Event: In third paragraph referenced accident titles are corrected for consistency at *Loss of **Offsite** Power Event* and *FESW **Pipe** Break*.
Page 9-8	Section 9.9, Wind and Tornado: Explanation is added to accident analysis as to why the Reactor Building modification, which created an opening covered with a bi-parting door, does not result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component important to safety previously evaluated. 50.59 Evaluation of Reactor Building Restoration Activities during RPV removal project provides documented support for this conclusion.
Page 9-9	Section 9.10, References: With content addition described for Section 9.9, section moves to an added page. Facility Change ***(FC) 37-06-34, Reactor Building Restoration Activities,*** is added as reference to information provided in Section 9.9.
Page 10-1	Section 10., SAFSTOR Operator Training and Certification Program: In the introductory section, definition is added as to whom training program is applicable to and unnecessary wording is removed. In applicability section further definition is provided and clarification is added to description of training program requirements.
Page 10-2 And Page 10-3	Pages of Section 10 are being re-issued due to revision causing page content shifts.

2008 LACBWR Decommissioning Plan Review

INITIAL SITE CHARACTERIZATION SURVEY FOR SAFSTOR (LAC-TR-138):

Cover Page	Update preparer's title and revision date.
Page 24 Through Page 28	Curie content values stated in pages 24-28 are updated. These pages of Attachments 1, 2, 3 have been decay-corrected to ***October 2008,*** replacing pages that had been decay-corrected to *October 2007*.
Page 25	Date of *October 2007* is deleted as unnecessary from Attachment 2 title above table. Some format and editorial changes are made to both upper and lower sections of table for consistency. This page will no longer require revision.

NRC

ATTACHMENT 1

10 CFR 50.59 SCREEN FORM

Document No. N/A **50.59 Screen Rev. No.** 0

Activity Title: Decommissioning Plan
Activity Description: 2008 annual review and update of the LACBWR Decommissioning Plan.
Document Listing: • LACBWR Decommissioning Plan, December 2007. • LACBWR Possession-Only License, Docket No. 50-409, Amendment No. 69, date of issuance April 11, 1997. • LACBWR Possession-Only License, Appendix A, Technical Specifications, Amendment No. 70, date of issuance April 3, 2006. • NRC to DPC, Confirmatory Order Modifying NRC Order Authorizing Decommissioning of Facility, dated September 15, 1994. • LACBWR Quality Assurance Program Description, Rev. 22, dated December 3, 2008. • Quality Assurance Project Plan, LACBWR, Dry Cask Storage Project, Rev. 1, dated June 2, 2008.
Design Functions: The Decommissioning Plan functions as a Final Safety Analysis Report (FSAR) at LACBWR and submittal of revisions to this FSAR fulfill requirements found in 10 CFR 50.71(e)(4). The Decommissioning Plan is also considered a Post-Shutdown Decommissioning Activities Report (PSDAR). NRC notification under 10 CFR 50.82(a)(7) is required if changes are inconsistent with or make significant schedule changes to those described in the PSDAR. None of the changes in this revision to the Decommissioning Plan describe activities that require prior notification.

ATTACHMENT 1

10 CFR 50.59 SCREEN FORM

10 CFR 50.59 Screening Questions	**Yes**	**No**
1. Does the proposed activity involve a change to a structure, system, or component (SSC) that adversely affects a design function described in the Decommissioning Plan?	☐	☒
2. Does the proposed activity involve a change to a procedure that adversely affects how SSC design functions, described in the Decommissioning Plan, are performed or controlled?	☐	☒
3. Does the proposed activity revise or replace evaluation methodology described in the Decommissioning Plan that is used in the safety analyses, or which establishes the design bases?	☐	☒
4. Does the proposed activity involve a test or experiment not described in the Decommissioning Plan, where a SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the Decommissioning Plan?	☐	☒
5. Does the proposed activity require a change to LACBWR Possession-Only License, Appendix A, Technical Specifications?	☐	☒
6. Will the proposed change result in a significant environmental impact not previously evaluated in NUREG-0586, Supp. 1, "Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities," dated November 2002?	☐	☒

Conclusion

☐	Any of questions 1, 2, 3, or 4 are answered **YES**; questions 5 and 6 are answered **NO**. 50.59 Evaluation shall be performed. This Screen form does not need to be retained.
☐	Questions 5 or 6 are answered **YES**. NRC approval is required prior to implementation of the activity; proceed to license amendment process. This Screen form does not need to be retained.
☒ BMW	All screening questions have been answered **NO**. 50.59 Evaluation or NRC approval is not required. Implement the activity per the applicable procedure for the type of activity. Attach this Screen form, as approved, to documentation for the activity. Provide justification that a 50.59 Evaluation is not required in the space below.

Justification:

Changes arise from annual review and update of D-Plan. These D-Plan changes add information to reflect the current status at LACBWR. Changes describe a modified and improved LACBWR organization. Changes describe modifications to plant systems performed under approved facility changes previously reviewed by separate 50.59 evaluations. Changes provide updated dose levels and activity concentrations, decay-corrected to current values. These D-Plan changes are administrative and have no adverse effect on any design bases nor create any significant environmental impact not previously evaluated.

Signatures

50.59 Screen Preparer (print name):	(Signature)	Date:
JEFF McRill	Jeff McRill	1/13/09
ORC Approval and Meeting No.	(Chairman Signature)	Date:
09-01	[signature]	1/13/09

LA CROSSE BOILING WATER REACTOR

(LACBWR)

D E C O M M I S S I O N I N G

P L A N

Revised
December 2008

DAIRYLAND POWER COOPERATIVE
LA CROSSE BOILING WATER REACTOR (LACBWR)
4601 State Road 35
Genoa, WI 54632-8846

TABLE OF CONTENTS

TABLE OF CONTENTS

Page No.

TABLE OF CONTENTS

Page No.

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

5. PLANT STATUS

5.1 SPENT FUEL INVENTORY

During June 1987 all fuel assemblies were removed from the reactor vessel. Currently there are 333 spent fuel assemblies stored in the spent fuel pool.

This spent fuel consists of three different types of fuel assemblies. Type I (82 assemblies) and Type II (73 assemblies) were fabricated by Allis-Chalmers (A-C) and Type III (178 assemblies) by EXXON. All of the fuel assemblies are 10x10 arrays of Type 348 stainless steel clad rods with stainless steel and Inconel spacers and fittings. The initial enrichment of the uranium in the Type I and Type II fuel was 3.63% and 3.92% respectively and the nominal average initial enrichment of the Type III fuel was 3.69%. The Type III assemblies contain 96 fueled rods and 4 inert Zircaloy-filled rods.

The 72 fuel assemblies removed from the reactor in June 1987 have assembly average exposures ranging from 4,678 to 19,259 megawatt-days per metric ton of uranium. The exposures of the 261 fuel assemblies discharged during previous refuelings range from 7,575 to 21,532 MWD/MTU. The oldest fuel stored was discharged from the reactor in August 1972. Forty-nine of the A-C fuel assemblies discharged prior to May 1982 contain one or more fuel rods with visible cladding defects and 54 additional A-C fuel assemblies discharged prior to December 1980 contain one or more leaking fuel rods as indicated by higher than normal fission product activity observed during dry sipping tests.

The estimated radioactivity inventory in the 333 spent fuel assemblies is tabulated in Table 5-1.

TABLE 5-1

SPENT FUEL RADIOACTIVITY INVENTORY

January 1988 [(a)]

Radio-nuclide	Half Life (Years) [(b)]	Activity (Curies)	Radio-nuclide	Half Life (Years) [(b)]	(Curies)
^{144}Ce	7.801 E-1	2.636 E+6	^{90}Sr	2.770 E+1	1.147 E+6
^{137}Cs	3.014 E+1	1.666 E+6	^{241}Pu	1.440 E+1	1.138 E+6
^{106}Ru	1.008 E+0	1.524 E+6	^{55}Fe *	2.700 E+0	5.254 E+5
^{95}Zr(Nb)	1.754E-1 (9.58E-2)	3.555 E+5	^{95}Zr *	1.750 E-1	3.52 E+2

(a) Computer Program, FACT-1, DPC, July 1987, and hand calculations.
(b) Computer Program, TPASGAM, Nuclide Identification Package, J. Keller, Analytical Chemistry Division, ORNL, June 1986.

* Activity in fuel assembly hardware based on neutron activation analysis.

TABLE 5-1 – (cont'd)

Radio-nuclide	Half Life (Years) [(b)]	Activity (Curies)	Radio-nuclide	Half Life (Years) [(b)]	(Curies)
^{95}Zr(Nb)	1.754E-1 (9.58E-2)	3.555 E+5	^{95}Zr *	1.750 E-1	3.52 E+2
^{134}Cs	2.070 E+0	3.291 E+5	^{59}Ni *	8.000 E+4	2.87 E+2
^{85}Kr	1.072 E+1	1.160 E+5	^{99}Tc	2.120 E+5	2.76 E+2
^{110m}Ag	6.990 E-1	1.018 E+5	^{125}Sb	2.760 E+0	2.73 E+2
^{89}Sr	1.385 E-1	1.009 E+5	^{155}Eu	4.960 E+0	1.68 E+2
^{127m}Te	2.990 E-1	8.238 E+4	^{234}U	2.440 E+5	6.37 E+1
^{60}Co *	5.270 E+0	6.395 E+4	^{243}Am	7.380 E+3	6.31 E+1
^{103}Ru	1.075 E-1	6.334 E+4	^{113m}Cd	1.359 E+1	1.78 E+1
^{147}Pm	2.620 E+0	4.129 E+4	^{94}Nb *	2.000 E+4	1.59 E+1
^{63}Ni *	1.000 E+2	3.540 E+4	^{135}Cs	3.000 E+6	1.40 E+1
^{141}Ce	8.890 E-2	2.638 E+4	^{238}U	4.470 E+9	1.22 E+1
^{242}Cm	4.459 E-1	1.858 E+4	^{156}Eu	4.160 E-2	8.63 E+0
^{241}Am	4.329 E+2	1.474 E+4	^{242}Pu	3.760 E+5	8.58 E+0
^{238}Pu	8.774 E+1	1.262 E+4	^{236}U	2.340 E+7	6.32 E+0
^{239}Pu	2.410 E+4	8.837 E+3	^{121m}Sn	7.600 E+1	4.44 E+0
^{240}Pu	6.550 E+3	7.165 E+3	^{237}Np	2.140 E+6	2.19 E+0
^{154}Eu	8.750 E+0	4.020 E+3	^{235}U	7.040 E+8	1.89 E+0
^{244}Cm	1.812 E+1	3.603 E+3	^{151}Sm	9.316 E+1	1.51 E+0
^{51}Cr *	7.590 E-2	3.002 E+3	^{126}Sn	1.000 E+5	7.01 E-1
^{129m}Te	9.340 E-2	1.170 E+3	^{79}Se	6.500 E+4	5.52 E-1
^{3}H	1.226 E+1	5.510 E+2	^{129}I	1.570 E+7	3.90 E-1
^{59}Fe *	1.220 E-1	5.120 E+2	^{93}Zr	1.500 E+6	1.11 E-1
^{152}Eu	1.360 E+1	5.110 E+2	^{131}I	2.200 E-2	2.00 E-3
^{242m}Am	1.505 E+2	4.900 E+2			

(a) Computer Program, FACT-1, DPC, July 1987, and hand calculations.
(b) Computer Program, TPASGAM, Nuclide Identification Package, J. Keller, Analytical Chemistry Division, ORNL, June 1986.

* Activity in fuel assembly hardware based on neutron activation analysis.

5.2 PLANT SYSTEMS AND THEIR STATUS

5.2.1 Reactor Vessel and Internals

The reactor vessel consisted of a cylindrical shell section with a formed integral hemispherical bottom head and a removable hemispherical top head bolted to a mating flange on the vessel shell to provide for vessel closure. The vessel had an overall inside height of 37 feet, an inside diameter of 99 inches, and a nominal wall thickness of 4 inches (including 3/16-inch of integrally bonded stainless steel cladding).

The reactor vessel was a ferritic steel (ASTM A-302-Gr-B) plate with integrally bonded Type 304L stainless steel cladding. The flanges and large nozzles were ferritic steel (ASTM A-336) forgings. The small nozzles were made of Inconel pipe.

The reactor internals consisted of the following: a thermal shield, a core support skirt, a plenum separator plate, a bottom grid assembly, steam separators, a thermal shock shield, a baffle plate structure with a peripheral lip, a steam dryer with support structure, an emergency core spray tube bundle structure combined with fuel holddown mechanism, control rods and the reactor core.

System Status

All fuel assemblies have been removed from the reactor vessel. Startup sources have been disposed of.

The reactor vessel with head installed, internals intact, and 29 control rods in place was filled with low density cellular concrete. Attachments to the reactor vessel flange were removed to a diameter of 119 inches. All other nozzles and appurtenances were cut to within the diameter of the flange. Under-vessel nozzles and appurtenances were removed from an envelope of within 6 inches of bottom dead center of the reactor vessel shell bottom.

The reactor pressure vessel was removed from the Reactor Building and shipped to the Barnwell Waste Management Facility in June 2007.

5.2.2 Forced Circulation System

The Forced Circulation System was designed to circulate sufficient water through the reactor to cool the core and to control reactor power from 60 to 100 percent.

Primary water passed upward through the core, and then down through the steam separators to the re-circulating water outlet plenum. The water then flowed to the 16-in. forced circulation pump suction manifold through four 16-in. nozzles and was mixed with reactor feedwater that entered the manifold through four 4-in. connections. From the manifold, the water flowed through 20-in. suction lines to the two 15,000 gpm variable-speed forced-circulation pumps.

Hydraulically-operated rotoport valves were installed at the suction and discharge of each pump. The 20-in. pump discharge lines returned the water to the 16-in. forced-circulation pump discharge manifold. From the manifold, the water flowed through four equally spaced 16-in. reactor inlet nozzles to the annular inlet plenum, and then downward along the bottom vessel head to the core inlet plenum.

The system piping was designed for a maximum working pressure of 1450 psig at 650°F (a pressure above the maximum reactor working pressure to allow for the static head and the pump head). Since the piping from the reactor to the rotoport valves was within the biological shield and not accessible, the valves and piping were clad with stainless steel. The piping between the rotoport valves and the pumps was low-alloy steel.

Each forced circulation pump had an auxiliary oil system and a hydraulic coupling oil system. Each auxiliary oil system supplied oil to cool and lubricate the three (1 radial and 2 thrust) pump coupling bearings. Each hydraulic coupling oil system supplied cooled oil at a constant flow rate to the hydraulic coupling.

System Status

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 and are not maintained operational.

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.

5.2.3 Seal Injection System

The Seal Injection System provided cooling and sealing water for the seals on the two Forced Circulation (F.C.) Pumps and the 29 control rod drive units.

The Seal Injection System has two positive-displacement pumps, supplied with water from the seal injection reservoir. The reservoir is supplied from the Condensate Demineralizer System with a backup supply from the overhead storage tank. One pump is required for operation with the other on standby.

A cartridge-type filter is provided in the pump suction header. A deaerator, vented to the seal injection reservoir, is located on the suction of the pumps to remove entrained air from the system in the event air is introduced during makeup to the system.

Bladder-type accumulators are connected to the suction and discharge of each seal injection pump. The suction accumulators reduce pump and piping vibrations. The discharge accumulators dampen the pulsating flow from the pumps to provide the constant flow rate which is required for stable system conditions.

The water to the F.C. pump seals passes through a full-flow filter. There are two filters arranged in parallel with one normally in service and the other in standby. The filtered water is then distributed to the two F.C. pump seals. Each seal supply line contains a flow control valve, check valve, and a three-way valve for switching injection points on the seal. Both valves in each supply line can be operated from the Control Room.

The water to the control rod drive seals is filtered in the same manner as that of the F.C. pumps seals. The water passes through a flow control valve which maintains a constant flow rate to the seals. The individual supply lines to the 29 control rod drive units each have a throttle valve and flow indicator for setting the required flow rate to each seal. The normal leakoff from the seals (0.15 gpm or less) is drained to the reactor basement floor sump.

Continuous blowdown of water from the control rod drive upper housing is removed through a connection on each control rod drive upper housing flange. Each line contains a throttle valve, and all lines join at a common manifold, from which suction is taken by the control rod nozzle effluent pumps. The pumps discharge into the inlet of the Decay Heat System, which is directly connected to the Forced Circulation System.

System Status

This system is drained and not maintained operational.

5.2.4 Decay Heat Cooling System

The Decay Heat Cooling System is a single high pressure closed loop containing a pump, cooler, interconnecting piping, and the necessary instrumentation.

The decay heat loop is connected across the 20-in. Forced Circulation Pump 1A supply and return lines on the reactor side of the Forced Circulation Pump isolation valves. Both connections to the forced circulation piping are located outside the reactor biological shield.

Reactor water from the Forced Circulation Pump supply line passes through an 8-in. line to the suction side of the Decay Heat Pump. The water is then discharged through a 6-in. line into the Decay Heat Cooler where it is cooled and returned to the Forced Circulation Pump return line.

A 2-in. blowdown line to the Main Condenser takes off downstream of the Decay Heat Cooler. This may be used to remove the excess water due to seal inleakage and thermal expansion of the water.

Another 2-in. line downstream of the Decay Heat Cooler connects to the reactor vessel head vent line which can be used to promote better circulation of the water within the reactor vessel head.

System Status

This system is not required to be operable and has been drained.

5.2.5 Emergency Core Spray System

The Emergency Core Spray System consists of a spray header with individual spray lines for each fuel assembly mounted inside the reactor vessel.

The low pressure supply line allows the demineralized water from the Overhead Storage Tank, or the service water from the High Pressure Service Water (HPSW) supply line, to flow directly to the core spray header. The flow from the Overhead Storage Tank to the spray nozzles has been calculated to be approximately 85 gpm, assuming that the reactor vessel and the Reactor Building are at the same pressure.

The core spray line penetrates the north wall of the biological shield at approximately 11 feet above the intermediate floor and enters the reactor vessel through a 1½-inch nozzle on the northwest quadrant. The core spray header above the top of the core spray tube support grid, supplies the 72 spray lines. An individual 3/8-inch spray line is provided for each fuel element.

The spray lines are installed concentrically within tubes. Each spray line contains a needle valve on the spray header used to set the flow for each fuel assembly location. The valve stems are staked after being set so the required flow will be obtained when the reactor is operating at 577°F. The required flow per assembly varies between 0.40 and 0.87 gpm, depending on the assembly location.

System Status

The Emergency Core Spray Pumps, associated piping and valves have been removed.

5.2.6 Boron Injection System

The purpose of the Boron Injection System was to inject enough sodium pentaborate solution into the Primary System to make the Reactor subcritical in the event of stuck control rods.

System Status

This system has been removed.

5.2.7 Primary Purification System

The Primary Purification System is a high pressure, closed loop system consisting of a Regenerative Cooler, Purification Cooler, Pump, two Ion Exchangers and filters.

The functions of the Primary Purification System were:

(1) to maintain optimum reactor water quality (pH and conductivity) to minimize corrosion,

(2) to remove dissolved and suspended solids in order to minimize fouling of heat transfer surfaces, pipes and vessels, and maintain primary coolant activity level low, and

(3) to provide an alternate means of removing excess reactor water.

System Status

The Ion Exchange resins have been removed and the system has been drained.

5.2.8 Alternate Core Spray System

The Alternate Core Spray System consists of two diesel-driven High Pressure Service Water (HPSW) pumps which take a suction from the river and discharge to the reactor vessel through duplex strainers and two motor-operated valves installed in parallel.

The Alternate Core Spray System was installed to provide backup for the High Pressure Core Spray System. It provided further assurance that melting of fuel-element cladding will not occur following a major recirculation line rupture. It has a secondary function of providing backup to the High Pressure Service Water System and Fire Suppression System.
The Emergency Service Water Supply System (ESWSS) Pumps were portable pumps which served as backups to the diesel-driven High Pressure Service Water Pumps in the event the Cribhouse or underground piping were damaged. The ESWSS system has been removed.

System Status

The Alternate Core Spray System is not required to be operational in SAFSTOR. Therefore, the manual isolation valve to the Reactor Building is closed. The 6-inch supply line to the reactor pressure vessel head has been removed as interference to removal of the reactor pressure vessel. Motor-operated valves and instrumentation in the Turbine Building have been electrically removed. System components continue to serve requirements of the HPSW System. These components will be designated as part of the HPSW System in the near future.

5.2.9 Control Rod Drive Auxiliaries

The function of this system was to provide hydraulic fluid under pressure for the purpose of hydraulically inserting the control rods when an immediate plant shutdown was necessary.

System Status

This system has been removed along with the lower Control Rod Drive mechanisms.

5.2.10 Gaseous Waste Disposal System

This system routed main condenser gasses through various components for drying, filtering, recombining, monitoring and holdup for decay.

System Status

This system, except for the storage tanks, has been removed.

5.2.11 Fuel Element Storage Well System

The storage well is a stainless lined concrete structure 11 feet by 11 feet by approximately 42 feet deep. When full, it contains approximately 38,000 gallons.

It is completely lined with Type 316 stainless steel. The walls are 16-gauge sheet and the bottom a 3/8-inch plate. All joints are full penetration welds. Vertical and horizontal expansion joints in the storage well allow for thermal expansion. A three-section aluminum cover, with two viewing windows per section, has been manufactured to cover the pool.

Design values for the storage well are given below:

Well Floor: safe uniform live load . . . . 5,000 lb/ft^2

Spent fuel elements are stored in two-tiered racks in the Fuel Element Storage Well until removed to cask storage. A transfer canal connects the upper portion of the well to the upper vessel cavity and is closed with a water-tight gate and a concrete shield plug. The water level in the well is normally maintained at an elevation of ≥ 695 feet with fuel in upper rack.

Storage well cooling is accomplished by drawing water through a 6-inch penetration at elevation 679 feet, or a 4-inch line at elevation 679 feet 11 inches, and pumping it through the fuel storage well cooler and returning it to the well, with either of two storage well pumps. The return line enters the top of the storage well and extends down to discharge at elevation 695 feet. The bottom inlet line ends at the biological shield wall and is sealed with a welded plug.

Cleanup is provided by the FESW ion exchanger. A 4-inch line from the Overhead Storage Tank is used to flood the well or pump water back to the Overhead Storage Tank. Overflow and drain pipes from the well and cavity are routed to the retention tanks.

Normal makeup to the storage well is provided by demineralized water through one of two "FESW Remote Operated Fill Valves," which are operated from Benchboard E in the Control Room.

The cooling system is conservatively designed to remove the decay heat of a full core one week after shutdown, with the storage well water at 120°F and the ultimate heat sink, the river, at 85°F.

System Status

The Fuel Element Storage Well contains 333 irradiated fuel elements and will remain in operation as part of the SAFSTOR Program as long as wet fuel storage or wet fuel handling is necessary.

5.2.12 Component Cooling Water System

The Component Cooling Water System provides controlled quality cooling water to the various heat exchangers and pumps in the Reactor Building. It also serves as an additional barrier between radioactive systems and the river.

The Component Cooling Water System is a closed system consisting of two pumps, two heat exchangers, a surge tank, and the necessary piping, valves, controls, and instrumentation to distribute the cooling water.

The Component Cooling Water Pumps, Coolers, and the Surge Tank are located in the Turbine Building. Water flows from the pumps, to the cooler, and then to the component cooling water supply header in the Reactor Building.
The flow requirements of the components cooled by the Component Cooling Water System were as follows during plant operation:

		Design (GPM)	Nominal (GPM)
(1)	FCP Hydraulic Coupling Coolers	60	60
(2)	FCP Lube Oil Coolers	30	30
(3)	Shield Cooler	75	75
(4)	Control Rod Nozzle Effluent Pumps	30	30
(5)	Purification Pump	15	15
(6)	Purification Cooler	260	200
(7)	Reactor Building Air Conditioners	60 ea	120
(8)	Decay Heat Pump	20	20
(9)	Decay Heat Cooler	570	100
(10)	Fuel Element Storage Well Cooler	260	100
(11)	Sample Coolers	5-10 ea	40
(12)	Failed Fuel Element Location System Cooler	40	0
(13)	Station Air Compressors	20 ea	0
(14)	PASS		
	(a) Reactor Coolant Sample	10	5
	(b) Containment Atmosphere Sample	40	0
	TOTAL	1560	855

Water from each of the components, listed above, flows to the component cooling water return header. This header leaves the Reactor Building and connects to the suction of the Component Cooling Water Pumps. A sample stream from the supply header is monitored for radioactivity and returned to the suction header. The temperature of the water in the supply header is automatically controlled by varying the Low Pressure Service Water flow to the tube side of the Component Cooling Water Coolers.

System Status

This system remains operable and is run as needed to provide cooling water to the Fuel Element Storage Well Cooler and Reactor Building Air-Conditioners.

5.2.13 Shield Cooling System

The Shield Cooling System was designed to maintain the temperature of the thermal shield and biological shield concrete below 140°F and 150°F, respectively.

System Status

All system components external to the biological shield have been removed, but because they are inaccessible the cooling coils have been abandoned in place.

5.2.14 Shutdown Condenser System

The primary function of the Shutdown Condenser was to provide a backup heat sink for the reactor, in the event the reactor was isolated from the main condenser, by the closure of either the Reactor Building Steam Isolation valve or the Turbine Building Steam Isolation valve. In addition, the Shutdown Condenser acted as an over-pressure relief system in limiting over-pressure transients.

The Shutdown Condenser was located on a platform 10 feet above the main floor in the Reactor Building. Steam from the 10-inch main steam line passed through a 6-inch line, two parallel inlet steam control valves, back to a 6-inch line and into the tube side of the condenser where it was condensed by evaporating cooling water on the shell side. The steam generated in the shell was exhausted to the atmosphere through a 14-inch line which penetrates the Reactor Building. An area monitor was located next to the steam vent line near the containment shell penetration in order to detect excessive activity release in the event of Shutdown Condenser tube failures. The main steam condensate was collected in the lower section and returned to the reactor vessel by gravity flow. The condensate line leaving the condenser was a 6-inch line along the horizontal run and was reduced to four inches for the vertical section. Two parallel condensate outlet control valves were located in the 4-inch return line. The condensate line also contained two 2-inch vent lines which join together and return to the lower section of the condenser for returning any vapors and/or non-condensible gases which were carried into the condensate line to prevent perturbations in the condensate flow leaving the condenser. The lower section in turn was vented to the offgas system through a 1-inch vent line. Flow in this vent line was restricted by a 1/16th-inch orifice, which was built into and was an integral part of the shutdown condenser offgas control valve seat.

A vent line containing two parallel control valves was connected to the 6-inch condensate return line. The valves discharge directly to the Reactor Building atmosphere and were capable of remote manual operation to vent the primary system directly to the Reactor Building atmosphere under emergency conditions. They performed the function of "Reactor Emergency Flooding Vent Valves" to equalize water level in the building with that in the reactor vessel, for a below-core break, and "Manual Depressurization System (MDS)" to rapidly depressurize the reactor vessel, on failure of the HPCS coincident with a major leak.

System Status

This system has been removed.

5.2.15 Hydraulic Valve Accumulator System

The major components of the Hydraulic Valve Accumulator System are mounted on a common bed plate on the grade floor of the Reactor Building. The system consists of a water accumulator tank, a water return sump tank, two air compressors, two water pumps, piping, valves, and the necessary instrumentation and controls. Approximately 300 gallons of demineralized water is maintained in the Water Accumulator Tank by pumps which take a suction from the Water Return Sump Tank. The level is automatically maintained by a float switch which operates the pumps as required. The water is stored in the Accumulator Tank under 140 psi air pressure which is supplied by air compressors. The air compressors are automatically controlled by a pressure switch and are interlocked with the level float switch to prevent the compressors from running while a pump is running.

The function of the Hydraulic Valve Accumulator System is to supply the necessary hydraulic force to operate the five piston-type valve actuators, which operate the five Rotoport valves in the Forced Circulation and Main Steam Systems.

System Status

This system has been drained. The air compressors, water pumps, and other equipment have been electrically disconnected and are not maintained operational.

5.2.16 Well Water System

Water for this system is supplied from two deep wells. Well No. 4 is located 115 feet southeast of the containment vessel center, and Well No. 3 is located 205 feet northeast of this centerline. The wells are 12 inches in diameter, with 8-inch pump casings and piping. The upper 40 feet of casing is set in concrete. The pumps are sealed submersible pumps. They take suction through stainless steel strainers, and they discharge into pressure tanks.

The system supplies water to the plant and office for sanitary and drinking purposes. Water supplied by the system is used at personnel and material decontamination stations. It is used as cooling water for the two Turbine Building air-conditioning units and in the heating boiler blowdown flash tank and sample cooler. The well water system is the source of supply to laundry equipment.

System Status

This system is maintained in continuous operation.

5.2.17 Demineralized Water System

The Virgin Water Tank provides the supply to the Demineralized Water Transfer Pumps which distribute demineralized water throughout the plant, including to the Overhead Storage Tank and the Fuel Element Storage Well Makeup in the Reactor Building. Water is demineralized in batches at the Genoa #3 generating plant, transferred to LACBWR where it is sampled, and, if of acceptable quality, stored in the Virgin Water Tank.

The Condensate Storage Tank and the Virgin Water Tank are actually two sections of an integral aluminum tank located on the office building roof. The lower section of this tank is the Condensate Storage Tank, and it has a capacity of 19,100 gallons. The upper, virgin-water, section will hold 29,780 gallons. Both tanks have high- and low-level alarm protection, and each tank level is transmitted to and shown on level indicators in the Control Room.

System Status

The Demineralized Water System will remain in service, mainly as a source of water for the Fuel Element Storage Well and the heating boiler.

The Condensate Storage Tank status is covered under the Condensate System, as it provided the makeup supply for that system.

5.2.18 Overhead Storage Tank

The Overhead Storage Tank is located at the top of, and is an integral part of, the Reactor Building.

The Overhead Storage Tank System consists of the approximately 45,000-gallon tank, the tank level instrumentation and controls, and the piping to the first valve of the systems served by the tank.

The Overhead Storage Tank (OHST) served as a reservoir for water used to flood the Fuel Element Storage Well reactor vessel and upper vessel cavity during refueling. The OHST acted as a receiver for rejecting refueling water using the Primary Purification System. The OHST supplied the water for the Emergency Core Spray System and Reactor Building Spray System, and was a backup source for the Seal Injection System.

System Status

The Overhead Storage Tank remains in use, primarily for a source of makeup water to the Fuel Element Storage Well. A 4-inch line from the OHST is used to flood the well or pump water back to the OHST using FESW System pumps, valves, and piping.

5.2.19 Station and Control Air System

There are two single-stage positive displacement lubricated type compressors. The complete compressor consists of an encapsulated compressor system, inlet system, cooling system, and control system. The encapsulated compressor includes compressor unit, fluid management system, and motor section. One compressor is normally running, and the other compressor can be started when necessary. 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. Station air is provided to the Cribhouse, where it is piped to near the suction of the Low Pressure Service Water pumps; to the High Pressure Service Water tank to charge the tank; and to the generator and reactor plants at all floor levels, for station usage as needed.

Control air is supplied from the receiver discharge header through a refrigerated air dryer and coalescing filter to various instruments and valves in the reactor and generator plants.

Alarms are provided in the Control Room to warn of low control air header pressure and compressor failures.

System Status

This system is maintained and in continuous operation.

5.2.20 Low Pressure Service Water System

The system is supplied by two vertical pumps located in the Cribhouse through a duplex strainer unit. The Low Pressure Service Water (LPSW) system supplies the Component Cooling Water coolers and Circulating Water pump mechanical seals, and is the normal supply to the High Pressure Service Water (HPSW) system through the motor-driven HPSW pump. During plant operation the LPSW system also supplied the Turbine Lube Oil coolers, generator hydrogen system coolers, Condenser Vacuum pump, and Reactor Feedwater pumps.

System Status

This system is maintained in continuous operation.

5.2.21 High Pressure Service Water System

The High Pressure Service Water (HPSW) system supplies fire suppression water and is available as backup cooling water for the Component Cooling Water coolers. During normal operation, HPSW system pressure is maintained by the LPSW system. A motor-driven HPSW pump with suction from the LPSW system is available for periods of high demand. With the motor-driven pump cycling in automatic, HPSW system pressure is maintained 110 to 135 psig at the expansion tank pressure switch elevation, 25 feet above site grade elevation. The pump is protected by a 35-psig low suction pressure trip. Backup supply is available from two HPSW diesel pumps. 1A HPSW Diesel Pump will start automatically if system pressure decreases to 90 psig. 1B HPSW Diesel pump will start automatically if system pressure decreases to 80 psig. The HPSW diesel pumps will maintain system pressure at approximately 150 psig. System pressure swings are cushioned by the air space in the HPSW surge tank.

The HPSW system is divided into two main loops. The internal loop serves the Turbine Building, Reactor Building, and Waste Treatment Building interior hose stations and sprinkler systems. The external loop supplies outside fire hydrants and Cribhouse sprinklers. The external loop is also cross-connected with the Fire Suppression System of the adjacent coal-fired generating facility, Genoa Unit 3. This cross-connect provides excess HPSW diesel pump capacity to this operating plant.

System Status

This system is maintained in operation to provide fire protection.

5.2.22 Circulating Water System

Circulating water is drawn into the Cribhouse intake flume from the river through traveling screens by circulating water pumps 1A and 1B, which are located in separate open suction bays. Each pump discharges into 42-inch pipe; the pipes 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 pipes feeding the top section of the water boxes. The main condenser is a two-pass divided water box type. Circulating water enters the top section of the condenser tube side and is discharged from the bottom section tube side. The condenser tubes extend the length of the condenser and are fastened at each end to the tube sheets inserted between the water boxes and the shell.

The 42-inch condenser circulating water outlet lines tie into a common 60-inch line which discharges to the seal well from Genoa Unit 3, located approximately 600 feet downstream from the LACBWR Cribhouse.

System Status

This system is maintained operational for periodic use for dilution of liquid waste discharges.

5.2.23 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. Two identical full-capacity condensate pumps took suction from the hotwell, and pumped the condensate through a full-flow demineralizing system, the air ejector condensers, the gland steam exhaust condenser and two feedwater heaters before entering the feed pumps.

The Condensate System also supplied the turbine exhaust sprays, the reactor feed pump shaft sealing cooling system, the normal makeup to the seal injection system, and gland seal steam generator. Hotwell level is maintained by automatic makeup from, or overflow to, the Condensate Storage Tank.

System Status

This system has been removed, with the exception of three feedwater heaters that remain in place with piping connections removed. The Condensate Storage Tank has been left dry.

5.2.24 Reactor Feedwater Pumps

The feedwater pumps took preheated condensate from No. 2 feedwater heater and delivered it through No. 3 feedwater heater to the reactor. The pumps boosted the system pressure from about 200 psi to approximately 1300 psi. The pump coupling arrangement is such that pump speed, and therefore capacity, may be varied to control reactor water level. Each pump was a separate unit containing all the auxiliaries, controls, and other components necessary for independent operation.

System Status

The Reactor Feedwater Pumps have been removed.

5.2.25 Full-Flow Condensate Demineralizer System

The Full-Flow Condensate Demineralizer System consisted of three service tanks, each with one-half system capacity and arranged in parallel. Its purpose was to remove ionic impurities from the condensate system water before admitting it to the reactor. Each service tank was capable of delivering 700 gpm. With one of the three tanks on standby, the system was capable of delivering 1400 gpm to satisfy primary system requirements. The standby service tank was available for service whenever the effluent conductivity of the inservice tanks rose to an unacceptable level. Each of the three demineralizer tanks normally contained 45-50 ft^3 of pre-regenerated mixed resins with a cation/anion ratio of 2 to 1. The three service tanks were designed for 400 psig operation, and normal flow was supplied by the condensate pumps. A circulating pump was provided to circulate water through the standby demineralizer tank prior to placing it into service.

System Status

This system, except for six empty tanks located in the Full-Flow room, has been removed.

5.2.26 Steam Turbine

The turbine was a high pressure, condensing, reaction, tandem compound, reheat 3600 rpm unit rated at 60,000 KW with the following steam conditions: 1250 psig, 547°F, exhausting at 1.0" Hg Absolute. The turbine consisted of a high pressure and intermediate pressure and a low pressure element.

System Status

Steam piping in the Turbine Building, turbine inlet valves, and other components and instrumentation have been removed for reprocessing and disposal. Complete removal of the Steam Turbine system is in progress.

5.2.27 60-Megawatt Generator

The 60-Mw generator was a high-speed turbine-driven wound-rotor machine that was rated at 76,800 kva, 85 percent P.F., 3600 rpm, 60 cycle, 3 phase, 13,800v A-C, and 3213 amp. 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. A reserve exciter was provided.

System Status

The main and reserve exciters have been disposed of. The generator rotor has been removed and unconditionally released for reuse. Complete removal of the 60-megawatt Generator system is in progress.

5.2.28 Turbine Oil and Hydrogen Seal Oil System

The Turbine Bearing Oil System received cooled oil from the lube oil coolers to supply the necessary lubricating and cooling oil (via a bearing oil pressure regulator) to the turbine and generator bearings, exciter bearings, and exciter reduction gear. During normal operation, the necessary oil pressures were provided by the attached lube oil pump. During startup and shutdown, an ac motor-driven auxiliary lube oil pump provided oil pressure. Backup protection consisted of the ac turbine bearing oil pump and the dc emergency bearing oil pump.

The Hydrogen Seal Oil System received cooled oil from the lube oil coolers and supplied this oil, via a pressure regulator, to the inboard and outboard hydrogen seals of the generator. Backup protection was provided in the event the normal supply pressure dropped or was lost, with an ac hydrogen seal oil pump and a dc emergency hydrogen seal oil pump.

Flexibility of the Turbine Oil Transfer System was brought about by the piping arrangement that allowed the lubricating oil to be transferred or purified from several sources. With the lube oil transfer pump, turbine oil could be transferred from the lube oil reservoir to either the clean oil or dirty oil tanks located in the oil storage room.

System Status

This system, with exception of the drained clean and dirty oil tanks, has been removed.

5.2.29 Heating, Ventilation, and Air-Conditioning Systems

The Reactor Building ventilation system utilizes 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 is provided with a filter box assembly, face and bypass dampers, and one 337,500-Btu/hr capacity steam coil that is used when heating is required. Air enters the building through two series 20-inch dampers and is exhausted from the building by action of the stack blowers. Additional exhaust flow is available using a centrifugal exhaust fan that has a capacity of 6000 cfm at 4 inches of water static pressure. The exhaust fan and building exhaust air discharge through two series 20-inch dampers to the Reactor Building ventilation outlet plenum connected to the tunnel.

A 20-inch damper is also provided for recirculation of the exhaust fan discharge air. The exhaust system is provided with conventional and high-efficiency filters and with a gaseous and particulate radiation monitor system.

The Waste Treatment Building ventilation is provided by a 2000-cfm exhaust fan that draws air from the shielded vault areas of the building and exhausts the air through a duct out the floor of the building to the waste gas storage vault. The stack blowers then exhaust the air from the waste gas storage vault through the connecting tunnel and discharge the air up the stack.

The exhaust air from the Reactor Building and the Waste Treatment Building are discharged into the tunnel connecting the Waste Treatment Building, the Reactor Building, and the Turbine Building to a plenum at the base of the stack. The stack is 350 feet high and is of structural concrete with an aluminum nozzle at the top. The nozzle tapers to 4 feet 6 inches at the discharge, providing a stack exit velocity of approximately 70 fps with the two 35,000-cfm stack blowers in operation.

The Turbine Building heating system provides heat to the turbine and machine shop areas through unit heaters and through automatic steam heating units.

The Control Room Heating and Air-Conditioning unit serves the Control Room, Electrical Equipment Room, Shift Supervisor's area, and adjacent office.

The office area and laboratory are provided with a separate multi-zone heating and air-conditioning unit.

The heating boiler is a Cleaver-Brooks, Type 100 Model CB-189, 150-hp unit. At 150 psig, the boiler will deliver 6,275,000 Btu/hr. The boiler fuel is No. 2 fuel oil. The oil is supplied by and atomized in a Type CB-1 burner which will deliver 45 gph.

Two 14.7-kW resistance heaters with power supplied from the essential busses are available to heat the Reactor Building in the event normal heating is lost.

System Status

These systems are maintained operational and used as conditions require.

5.2.30 Waste Collection Systems

The functions of the Waste Collection and Treatment System are:

(1) To collect and store radioactive liquid waste generated in the plant.

(2) To collect and transfer depleted ion exchange resins to a shipping container.

(3) To process the collected waste as required for safe and economical disposal.

The Turbine Building Waste Collection System collects the liquid waste from the Turbine Building, the Waste Treatment Building, the waste gas storage vault, and the tunnel area in two storage tanks (one 4500 gal. and one 3000 gal.) located in the tunnel between the Reactor Building and the Turbine Building.

The Reactor Building 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 the retention tanks and from the retention tanks out of the Reactor Building.

After a tank's contents are recirculated, a sample is withdrawn from the tank and analyzed for radioactivity concentrations prior to discharge.

The total amount of liquid waste discharged to the circulating water discharge line is measured with a flow totalizer water meter which can handle flow rates up to 100 gpm and a flow rate monitor with Control Room readout.

Spent resin will be transferred to the spent resin receiving tank, where it will be held until there is a sufficient quantity available for shipment to an approved processing facility. The resin will be transferred to an approved shipping container where it will be dewatered and made ready for shipment.

System Status

The Waste Collection Systems are maintained operational.

5.2.31 Fuel Transfer Bridge

The fuel transfer bridge is a specially-designed structure which is power-driven north and south on rails recessed in the floor at elevation 701'0" of the Reactor Building.

The bridge traverses over the areas where service operations are performed at the reactor cavity, transfer canal, spent fuel storage pool and the new fuel storage racks. The bridge serves as the structural support for the fuel transfer hoist, and it provides an operating platform for personnel.

System Status

The fuel transfer bridge is kept operational and is tested routinely.

5.2.32 Communications Systems

The communications systems installed or otherwise available in the plant are:

(1) Central office trunk line telephone service for off-plant local and long distance calls.

(2) PABX (Private Automatic Branch Exchange) for interplant and intraplant calls and for off-plant calls to or from the site.

(3) Paging system for in-plant and site calls.

(4) DPC ultra high-frequency radio network, for voice communications within DPC systems and headquarters, including mobile units.

(5) Microwave system for calls between LACBWR, Genoa Station No. 3, La Crosse, and Alma, and for calls to local numbers in La Crosse.

(6) Portable transceivers (handie-talkie) for mobile interplant and site voice communication.

System Status

The various communications systems are presently maintained operational.

5.2.33 Electrical Power Distribution

5.2.33.1 Normal AC Distribution

69-KV power is supplied to the reserve auxiliary transformer located in the LACBWR switchyard through a three-phase air disconnect switch and three 30-amp, 69-KV fuses.

Air Circuit Breakers 252R1A and 252R1B supply the 2.4-kv Bus 1A and Bus 1B from the 69/2.4-KV reserve transformer.

The 2400/480-volt Auxiliary Transformers 1A and 1B receive their power from the 2400-volt Buses 1A and 1B through Air Circuit Breaker 252AT1A from Bus 1A to Transformer 1A, and through Air Circuit Breaker 252AT1B from Bus 1B to Transformer 1B. The auxiliary transformers supply the 480-volt Buses 1A and 1B through Air Circuit Breaker 452M1A for Bus 1A and through Air Circuit Breaker 452M1B for Bus 1B.

The 480-volt buses supply larger equipment directly. They also supply motor control centers which furnish power to motors and other associated equipment connected to them through their respective breakers, including Motor Control Center (MCC) 120-volt ac Distribution Panels which supply 120-volt ac to equipment and instrumentation.

The regular lighting cabinets are supplied from 480-volt buses 1A and 1B.

5.2.33.2 480-V Essential Buses 1A and 1B

The 480-v Essential Bus 1A Switchgear is normally supplied with electrical power from the 480-v Bus 1A through Breaker 452-52A. In the event of a loss of station power, the 480-v Essential Bus 1A is supplied with electrical power from Emergency Diesel Generator 1A through Breaker 452 EGA. Breakers 452-52A and 452 EGA are electrically interlocked to prevent both sources from supplying the bus.

The 480-v Essential Bus 1B Switchgear is normally supplied with electrical power from 480-v Bus 1B through Breaker 452-52B. In the event of a loss of station power, the 480-v Essential Bus 1B is supplied with electrical power from Diesel Generator 1B through Breaker 452 EGB. Breakers 452-52B and 452 EGB are electrically interlocked to prevent both from supplying the bus.

The 480-v Essential Buses 1A and 1B may be cross-connected through the 480-v Essential Bus Tie Breakers 452 TBA and 452 TBB.

5.2.33.3 Emergency Diesel Generators 1A and 1B

The 1A Diesel Generator set system consists of a 250-kw diesel generator, a day tank fuel supply, a fuel transfer pump, a remote radiator and fan, a 100-kw test load, a local engine instrument panel, a local generator panel, and a remote selector switch and alarms in the Control Room. The Diesel Generator set is located in the emergency generator cubicle which is on the grade floor level adjacent to the Machine Shop.

The function of the 1A Diesel Generator is to supply emergency power to the 480-v Essential Bus 1A which, in turn, supplies power to the Turbine Building MCC 1A, the Turbine Building 120-v Bus, the Turbine Building 120-v Regulated Bus and the feed to the Regulated Bus Auxiliary Panel.

The 1B Diesel Generator System consists of a 400 kw diesel driven generator, a 300-gallon fuel oil day tank, fuel oil transfer system and external remote radiator and fan, a 200 kw fan-cooled test load, a local engine control and instrument cabinet, and remote instrumentation and controls in the Control Room. The diesel generator set is located in the Generator Room of the Diesel Building which is south of the Electrical Penetration Room at elevation 641 feet.

The function of the 1B Diesel Generator is to supply emergency power to the 480-v 1B Essential Bus, which in turn supplies power to the Reactor MCC 1A 480-v Bus, Diesel Building MCC 480-v Bus, and the loads supplied by these MCC.

A feed from 480-v Essential Bus 1B to Genoa #3 Generating Station (G-3) provides G-3 an alternate source of energy to supplement their plant's batteries during emergency shutdown with subsequent plant blackout.

5.2.33.4 120-V Non-Interruptible Buses

The 120-v Non-Interruptible Buses maintained a continuous non-interruptible power supply to a portion of the essential plant control circuitry, communications equipment and radiological monitoring equipment.

The 120-v Inverter 1A was designed for 3 KVA output and was powered by 125-v dc from the Reactor Plant Battery Bank through the Reactor Plant dc Distribution Panel. An automatic transfer switch was provided that would transfer the output to an alternate 120-v ac source in the event the inverter or its dc source failed. The alternate source for Inverter 1A was the Turbine Building 120-v Regulated Bus. The Inverter 1A was located in the Electrical Equipment Room. Inverter 1A has been removed. Its distribution panel is powered from Turbine Building 120-v Regulated Bus and has been renamed 1A 120-V AC Essential Power.

The 120-v Non-Interruptible Bus 1B had the capability of being supplied with power from three sources. The normal main feed power source was supplied by Static Inverter 1B. The 5 KVA 1B Static Inverter was powered by 125-v dc from the Diesel Building Battery Bank through the Diesel Building 125-v dc Distribution Panel. Its alternate source was the Diesel Building MCC 480-v Bus through a static switch. The reserve feed power source was supplied by the Turbine

Building 120-v Regulated Bus, through a breaker on TB MCC 1A, that was used when the Static Inverter 1B was out of service. Static Inverter 1B has been removed from service. The Non-Interruptible Bus 1B is now supplied from the Turbine Building 120-v Regulated Bus and has been renamed the Regulated Bus Auxiliary panel.

The 120-v Inverter 1C was powered by 125-v dc from the Generator Battery Bank through the Generator Plant dc Distribution Auxiliary Panel. An alternate 120-v ac source was supplied through a breaker on Turbine Building MCC 1A through a static switch in the inverter. Inverter 1C has been removed. Its distribution panel is powered from Turbine Building MCC 1A and has been renamed 1C 120-V AC Essential Power.

5.2.33.5 125-v DC Distribution

The 125-V DC Distribution Systems supply DC power to all Generator Plant, Reactor Plant, and Diesel Building equipment requiring it.

The 125-V DC Distribution Systems were divided into three separate and independent systems each with its own battery, battery charger, and distribution buses. The buses could be cross-connected but were normally isolated from each other. The Reactor Plant and Diesel Building batteries and chargers have been removed. The Generator Plant Battery and Charger remain as the sole sources of DC power to the 125-V DC distribution system. The once three separate systems have been interconnected by using installed bus tie breakers.

For the system, the Generator Plant Battery Charger provides the normal DC supply with the Generator Plant Battery as the reserve supply. The battery floats on the line maintaining a full charge, and provides emergency DC power in the event of a loss of AC power to the battery charger or failure of the charger.

System Status

The Electrical Power Distribution System is maintained operational and required surveillance tests are performed on the Emergency Diesel Generators and 125-v batteries.

The Electrical Power Distribution System will be modified significantly. These modifications will configure the system to provide backup diesel generator power to the entire 480-V AC system. Facility power use has decreased below the capacity of the diesel generators making changes possible. Planned changes will ensure continued operation of normal lighting systems, air conditioning systems, and sanitary well water supply for habitability reasons and plumbing system use. Further simplification and reliability will be gained.

5.2.34 Post-Accident Sampling Systems

The Post-Accident Sampling Systems (PASS) are designed to permit the removal for analysis of small samples of either Reactor Building atmosphere, reactor coolant, or stack gas when normal sample points are inaccessible following an accident. These samples will aid in determining the amount of fuel degradation and the amount of hydrogen buildup in the Reactor Building. Samples will be removed to the laboratory for analysis.

5.2.34.1 Reactor Building Atmosphere PASS System Description

The Reactor Building Atmosphere Post-Accident Sampling System consists of a vacuum pump that takes suction from the Reactor Building atmosphere at the 714' elevation. The sample is drawn through a bypass line or to a remote sample cylinder and discharged back to the Reactor Building at the 671' elevation.

5.2.34.2 Stack Gas PASS System Description

The Stack Gas Post-Accident Sampling System makes use of the same equipment that provides the normal stack gas sample flow. The vacuum pump for stack gas sampling draws the extra flow, above what the stack monitors draw, to make the total flow isokinetic to the stack discharge. This flow can be diverted through the post-accident sample canister by opening manual isolation valves. The sample canister is connected to the system by two quick disconnects and, therefore, can be easily removed from the system and taken to the laboratory for analysis. The sample canister diversion valve is controlled from the local control panel in the No. 3 Feedwater Heater area.

5.2.34.3 Reactor Coolant PASS System Description

The Reactor Coolant Post-Accident Sampling System took primary coolant from an incore flux monitoring flushing connection, through 2 solenoid-operated isolation valves with a heat exchanger between them, to a motor-operated pressure reducing valve. Downstream of the pressure reducing valve, the coolant sample could be diluted with demineralized water which then flowed through the sample cylinder or its bypass valve, through another solenoid isolation valve, and back to the Reactor Building basement or to the waste water tanks.

System Status

The Stack Gas PASS System is maintained in continuous operation. The Reactor Coolant PASS System has been removed. The Reactor Building Atmosphere PASS System is retained in place.

5.2.35 Containment Integrity Systems

With the plant in the SAFSTOR condition, there is no longer a postulated accident that would result in containment pressurization or that takes credit for Containment integrity.

System Status

Containment integrity systems are not required to be operable.

5.3 RADIONUCLIDE INVENTORY ESTIMATES

Testing was conducted in-house, using Health Physics personnel, to determine the location and the quantities of the radionuclides present at LACBWR. Several different types of samples and sampling techniques were used to qualify/quantify the radionuclide inventory. Each method will be described in the initial site characterization survey for SAFSTOR. All samples were gamma scanned using HPGe detectors coupled to a gamma spectroscopy computer system. This equipment has been calibrated to NBS traceable sources and is checked periodically to maintain this calibration.

5. PLANT STATUS – (cont'd)

5.4 RADIATION LEVELS

5.4.1 Plant Radiation Levels

Upon entering the initial phase of LACBWR's SAFSTOR mode, base line gamma radiation surveys were performed throughout the plant. General area radiation levels are listed below. These levels will be routinely monitored and tracked. Specific area hot spots will also be looked for and recorded on each area survey.

Area	General Area Gamma Radiation Levels
Reactor Building:	
Shutdown Condenser Platform	10-20 mRem/hr
701' Level	6-12 mRem/hr
Mezzanine Level East	5-10 mRem/hr
Mezzanine Level West	20-30 mRem/hr
West Nuclear Instrument Platform	40-90 mRem/hr
East Nuclear Instrument Platform	10-20 mRem/hr
Purification Cooler Platform	5-10 mRem/hr
Grade Floor North and East	7-20 mRem/hr
Grade Floor West	75-120 mRem/hr
Upper Control Rod Drive Area	60-120 mRem/hr
Basement	10-40 mRem/hr
Primary Purification Demineralizer	7-17 mRem/hr
Retention Tank Area	250-400 mRem/hr
Lower Control Rod Drive Area	60-150 mRem/hr
Forced Circulation Pump Cubicles	150-400 mRem/hr
Turbine Building:	
Main Floor	<1-3 mRem/hr
Mezzanine	<1-4 mRem/hr
Stop Valve Area	10-85 mRem/hr
Grade Floor	1-10 mRem/hr
Feedwater Heater Area	5-20 mRem/hr
Tunnel	10-50 mRem/hr
Machine Shop	<1 mRem/hr
1B Diesel Room	<1 mRem/hr
Electrical Penetration Room	2-7 mRem/hr
Waste Treatment Building:	
Main Floor	1-20 mRem/hr
Basement	10-100 mRem/hr
Building Exteriors:	
Exterior of Waste Treatment Building	<1 except for south side where there is one spot between 3-4 mRem/hr
Exterior of Reactor Building	<1 except for one spot on south side reading 7 mRem/hr

5.4.2 System Radiation Levels

During SAFSTOR the major radioactively contaminated systems at LACBWR will be monitored in order to trend system cleanups and radioactivity decay. A program consisting of 100 survey points located throughout the plant has been established. Initial system contact readings have been taken and will be monitored on a frequency determined to adequately trend any radiation level changes. The individual survey locations may change during the SAFSTOR period as plant parameters change.

The following is a list of the initial survey points, their initial dose rates, and the current survey point dose rates.

Note: All readings are contact dose rates.

Survey Point #	*Survey Point Location*	*Initial Dose Rate (mRem/hr)*	*Current Dose Rate (mRem/hr)*
1	Condensate Line to and from OHST	25	*
2	Condensate Line to and from OHST	24	*
3	Condensate Line to and from OHST	33	*
4	1A Condensate Pump Discharge Line	12	*
5	Emergency Overflow Line	27	*
6	Emergency Overflow Bypass Line	33	*
7	Ice Melt Line	3	<1
8	1A Reactor Feed Pump	16	*
9	Near 1B Reactor Feed Pump Discharge Valve	11	*
10	Side of #3 Feedwater Heater	26	6
11	Reheater Level Control Chamber	26	*
12	South End of Reheater	13	<1
13	Gland Exhaust Condenser Loop Seal	35	*
14	Main Steam Line	48	*
15	Main Steam Line	50	*
16	Offgas System Flame Arrestor	8	*
17	1B Waste Water Pump	26	4
18	1A Waste Water Pump	60	7
19	End of 3000 Gallon Waste Tank	170	24
20	End of 4500 Gallon Waste Tank	120	11
21	Side of Gland Seal Steam Generator	1100	*
22	Side of Gland Seal Steam Generator	160	*
23	Main Steam Bypass Line	17	*
24	Turbine Inlet Valve Body	23	*
25	Main Steam Line	24	*
26	Reheat to Flash Tank Line	11	*

* Survey Point removed due to dismantlement activities.

5. PLANT STATUS – (cont'd)

Survey Point #	Survey Point Location	Initial Dose Rate (mRem/hr)	Current Dose Rate (mRem/hr)
27	Flash Tank	5	<1
28	Seal Injection Heater	31	*
29	#2 Feedwater Heater Bypass Line	100	*
30	Feedwater Heater Bypass Line	24	*
31	Bottom of Gland Exhaust Condenser	170	*
32	Top of Gland Exhaust Condenser	20	*
33	Condensate into Air Ejector Line	7	*
34	Air Ejector	8	*
35	Low Pressure Turbine Manhole Cover	6	<1
36	End of High Pressure Turbine	2	<1
37	Primary Purification 1A Filter Inlet Line	38	3
38	Primary Purification Pump	140	8
39	Exhaust Ventilation Duct	9	<1
40	Reactor Bldg. Grade Level N Shield Wall	6	<1
41	1A Fuel Element Storage Well Pump	70	9
42	1B Fuel Element Storage Well Pump	80	12
43	FESW Filter Discharge Line	180	29
44	FESW System Cooler	1000	210
45	Hydraulic Valve Actuation System Header	60	15
46	Base of Hydraulic Valve Accumulator	24	3
47	Wall at Electrical Penetration	30	3
48	Handrail on NW Nuclear Instrumentation (NI) Platform	100	15
49	Shield Wall on N NI Platform	4	<1
50	Primary Purification to OHST Line	6	<1
51	Above Primary Purification Cooler Inlet Valve	25	5
52	Cold Leg of Reactor High Level Transmitter Line	46	*
53	Seal Injection Reservoir	30	9
54	Reactor Cavity Drain Line	44	4
55	1A Core Spray Pump Discharge Line	10	*
56	Reactor Water Level Sightglass Line	180	*
57	Reactor Water Level Sightglass Line	100	*
58	Reactor Bldg. Mezzanine Level N Shield Wall	4	*
59	Steam Trap Reactor Bldg. Mezzanine Level NW Wall	23	*
60	Fuel Element Storage Well Line	400	7
61	Fuel Element Storage Well Line	420	35
62	Fuel Element Storage Well Line	60	10

* Survey Point removed due to dismantlement activities.

Survey Point #	*Survey Point Location*	*Initial Dose Rate (mRem/hr)*	*Current Dose Rate (mRem/hr)*
63	Fuel Element Storage Well Skimmer Line	90	14
64	Wall near Fuel Transfer Canal Drain	35	3
65	Relief Valve Platform at Level Transmitter	80	6
66	Shutdown Condenser	11	*
67	Shutdown Condenser Condensate Line	6	*
68	1B Retention Tank	300	30
69	1A Retention Tank	130	10
70	By Primary Purification Cation Tank	24	1
71	Decay Heat Cooler	25	4
72	Decay Heat Cooler	18	3
73	Decay Heat Cooler Bypass Valve	70	10
74	Decay Heat Pump Suction Line	32	22
75	Handrail at Shutdown Condenser Condensate Valves	28	5
76	Seal Injection DP Transmitter	44	*
77	Top of Upper Control Rod Drive Mechanism	370	65
78	Top of Upper Control Rod Drive Mechanism	200	37
79	Wire mesh screen on N Upper Control Rod Platform	22	2
80	Bottom of Upper Control Rod Drive Mechanism	1000	80
81	Top of Upper Control Rod Drive Mechanism	500	90
82	Bottom of Upper Control Rod Drive Mechanism	800	65
83	Effluent Lines on Upper Control Rod Platform	390	*
84	Sump Pump Discharge Line to Retention Tank	260	16
85	At Forced Circulation Pump Filters	33	3
86	Retention Tank Pump	60	5
87	Under Lower Control Rod Drive Mechanism	246	*
88	Control Rod Drive Hydraulic System Header	190	*
89	Decay Heat Pump	150	15
90	1B Forced Circulation Pump Suction Line	1000	100
91	1B Forced Circulation Pump Suction Line	1100	190
92	1A Forced Circulation Pump Suction Line	500	120
93	1A Forced Circulation Pump Suction Line	600	70
94	1A Forced Circulation Pump Discharge Line	700	70
95	Feedwater Line in Forced Circulation Cubicle	130	22
96	1A Forced Circulation Pump	130	18
97	Handrail at 1A Forced Circ. Pump Suction Line	250	20
98	1A Forced Circulation Pump Discharge Line	800	70
99	1A Forced Circulation Pump Discharge Line	600	70
100	1A Forced Circulation Pump Suction Line	700	50

* Survey Point removed due to dismantlement activities.

5.5 PLANT PERSONNEL DOSE ESTIMATE

During normal/routine SAFSTOR operations at LACBWR, average whole body radiation dose received by plant personnel should be no more than 0.600 Rem per individual per year. This average dose is expected to decrease during the SAFSTOR period due to isotopic decay. Individual doses will be dependent upon work being performed. Plant personnel will not be allowed to exceed 5.0 Rem/year.

5.6 SOURCES

As authorized by the facility license, sealed sources for radiation monitoring equipment calibration will continue to be possessed and used. Additionally, sources will be used as authorized without restriction to chemical or physical form for sample analysis, instrument calibration and as associated with radioactive apparatus and components.

5.7 RADIATION MONITORING INSTRUMENTATION

Radiation monitoring instrumentation for the LACBWR consists of fixed plant surveillance equipment, portable survey meters, laboratory-type counting instrumentation, and personnel monitoring equipment.

The Radiation Monitoring System performs the following functions:

(1) Provides a permanent record of radioactivity levels of plant effluents.

(2) Provides alarms and automatic valve closures to prevent excessive radioactive releases to environment.

(3) Provides warning of leakage of radioactive gas, liquid, or particulate matter within the plant.

(4) Provides continuous radiation surveillance in normally accessible plant areas.

(5) Provides portable instrumentation for use in conducting radiation surveys.

(6) Provides instrumentation for personnel and material contamination surveillance, including that necessary for control of egress from restricted areas.

(7) Provides pocket dosimeters and necessary charging and readout equipment for personnel radiation exposure control and estimates.

5.7.1 Fixed Plant Monitors

The plant fixed surveillance monitoring equipment consists of liquid monitors, air monitors, and area monitors.

5.7.1.1 Liquid Monitors. The liquid monitors consist of a modular nim bin electronic system in the Control Room coupled to a NaI scintillation detector. The NaI scintillation detector is coupled to a photomultiplier tube base-preamplifier.

5.7.1.2 Reactor Building Air Exhaust Gaseous and Particulate Monitor. A monitor is located on the Reactor Building mezzanine level. This monitor has a fixed filter particulate detector and a gaseous detector. It takes suction from the outlet of the Reactor Building ventilation filters.

5.7.1.3 Stack Monitor. A monitor is installed to sample the stack emissions. This monitor draws air from the stack through an isokinetic nozzle. This monitor detects particulate and gaseous activity released to the stack. This monitor alarms locally and in the control room.

5.7.1.4 Fixed Location Monitors. Area radiation monitors are used to detect and measure gamma radiation fields at various remote locations. There are fifteen remote units located throughout the plant. The measured dose rate is displayed on meters located in the Control Room.

5.7.2 Portable Monitors

Portable instruments are located throughout the plant. Instruments are available to detect various levels of beta, gamma, and alpha radiation.

5.7.3 Laboratory-Type Monitors

Laboratory instruments are available to determine contamination levels and radioisotope concentrations. These instruments consist of internal proportional counters, gamma analyzers, and liquid scintillation counters.

6. DECOMMISSIONING PROGRAM

6.1 OBJECTIVES

The primary objective of the Decommissioning Program at LACBWR will be to safely monitor the facility and prevent any unplanned release of radioactivity to the environment. Some of the goals during the SAFSTOR period are as follows:

To safely store irradiated fuel while minimizing risk to the public health and safety.

To maintain a radiation protection program that ensures SAFSTOR activities have minimal effect on the environment, the general public, and site personnel.

To maintain systems required during SAFSTOR period.

To handle radioactive waste generated during the SAFSTOR period in accordance with plant procedures and applicable requirements.

To limit plant personnel radiation exposure to levels as low as reasonably achievable (ALARA).

To dismantle unused systems with assurance that no unacceptable environmental impacts or other adverse effects are created from these activities.

To maintain qualified and trained staff.

6.2 ORGANIZATION AND RESPONSIBILITIES

The organization of the SAFSTOR staff at LACBWR is as indicated in Figure 6.1. The staff may change as activities being performed vary and staffing needs change. The organization is directed by a Plant Manager, who reports directly to the Dairyland Power Cooperative Vice President, Generation. The individuals who report directly to the Plant Manager each have distinct functions in ensuring the safety of the facility during the SAFSTOR mode.

The Plant Manager is responsible for the safety of the facility, its daily operation and surveillance, long range planning, and licensing. Quality assurance activities and security control and support are provided by a Cooperative-wide quality assurance and security program. The Plant Manager is responsible for operation of any onsite security required as well as ensuring compliance with the Quality Assurance Program Description (QAPD). The Plant Manager is responsible to ensure that adequate staff is present to comply with the terms of the license, training commitments and responsibilities are met, and that the personnel reporting are fit for duty.

The Operations, Training/Relief Supervisor is responsible for the day to day activities of the Shift Supervisors and Operators. This supervisor is responsible for the coordination of all Technical Specification required tests. This supervisor is responsible for proper implementation of the LACBWR Training Program.

The Shift Supervisor is responsible for operating the shift and ensuring that the facility is maintained in a safe and efficient manner. The Shift Supervisor directs and is responsible for all operations and maintenance activities occurring on shift. The Shift Supervisor ensures that routine rounds are made, logs are kept and equipment maintenance requests are properly initiated.

The Operators are responsible for the operation of the facility. They ensure that all equipment is operated in a proper manner consistent with the license and procedures of the facility. The Operators perform fuel handling operations and maintain qualification in compliance with their training certification. The Operators are responsible to ensure that procedural deficiencies discovered are identified. The Operators tour the facility and ensure that the fuel element storage well and supporting systems are operable and the cleanliness of the facility is maintained.

The Health and Safety/Maintenance Supervisor is responsible for the radiological health and safety of the general public in the area surrounding the plant as well as the safety of the staff and all visitors to the plant. The Health and Safety/Maintenance Supervisor ensures that all radiological and environmental monitoring programs are performed. This individual ensures that all radiation exposure controls are in place and ensures that contamination and daily, monthly and annual exposure limits on personnel are complied with. The Health and Safety/Maintenance Supervisor is responsible for the ALARA program and ensures that all personnel at LACBWR comply with ALARA requirements. This supervisor also assigns the day-to-day work of the Health Physics Technicians, Instrument Technicians, Electricians, and Maintenance Mechanics through coordination with Forepersons of these groups.

The Health Physics Technicians are responsible for the radiation protection and chemistry programs at LACBWR. They perform monitoring and surveillance of all work covered by special work permits. They maintain the exposure records of personnel, take readings necessary to guard against the spread of contamination and provide input to the long-term radionuclide inventory program. The Health Physics Technicians report, as directed by the Health and Safety/Maintenance Supervisor, to the Duty Shift Supervisor as required.

The Instrument Technicians are responsible for maintaining the instrumentation within the facility necessary to safely store the irradiated fuel. They perform surveillance tests required as well as maintenance requests initiated on instrumentation.

The Electricians are responsible for maintaining electrical equipment in operating systems in accordance with procedures and completing maintenance requests and surveillance tests that are required. They are responsible for maintaining equipment within the plant used by other DPC facilities for system reliability. They are also responsible for electrical breaker maintenance and such other responsibilities as assigned by supervision.

The Maintenance Mechanics are responsible for the completion of mechanical maintenance tasks. They are responsible for the completion of maintenance requests and surveillance tests of a mechanical nature. They are responsible for the preventive maintenance program established on those systems necessary to maintain the SAFSTOR condition. The Maintenance Mechanics are responsible for overall maintenance on plant equipment used by other DPC facilities for system reliability.

The Administrative Assistant is responsible for overall administration of LACBWR. The Administrative Assistant processes and maintains file records of all LACBWR programs, procedures, document changes, budget information, written communications, and numerous other records related to SAFSTOR activities. The Administrative Assistant ensures that clerical functions are performed adequately. This person maintains all budget expense and project accounts and coordinates preparation of the LACBWR budget. Duties include assigning to staff personnel required responses to regulatory agencies, other Dairyland departments, etc., and ensuring that these tasks are completed by the established deadline.

Additional administrative personnel are made available to the Administrative Assistant as needed, and assist in the clerical tasks at LACBWR. Such additional personnel are qualified to perform required communication functions and are assigned other tasks, as necessary, by the Administrative Assistant.

The Licensing Engineer is responsible for facility licensing during the SAFSTOR condition, during preparations for dry cask storage, and eventual license termination activities. The Licensing Engineer is the principal liaison on behalf of the Plant Manager for contact with the Nuclear Regulatory Commission and other regulatory agencies.

The Radiation Protection Engineer is responsible for radiation protection, projections and trending. This engineer is responsible for working with the Health and Safety/Maintenance Supervisor in ensuring that an aggressive ALARA program is carried out and that contamination and background radiation exposure are reduced as low as reasonably achievable during the SAFSTOR period.

The Reactor Engineer performs administrative functions in support of SAFSTOR operations and assists with plans for dry cask storage. The Reactor Engineer monitors stored fuel conditions and provides nuclear safety oversight. This engineer monitors the condition of structures, systems and components important to safety. Presently, the Reactor Engineer is assigned responsibilities of the LACBWR Accountability Representative as discussed in Section 6.8.

The Safety Review Committee (SRC) is the offsite review group responsible for oversight of facility activities. A quorum of four persons, including the chairman, is required. No more than a minority of the quorum shall have line responsibility for operation of the facility. The SRC shall meet at least once per year.

The Operations Review Committee (ORC) is the onsite review committee and is responsible for the review of day-to-day operations. A quorum of at least four individuals drawn from the management staff at the site, including the Plant Manager or designated alternate as chairman, is required. The ORC shall meet at least once per calendar quarter. The SRC and the ORC review material as required by the QAPD.

6.3 CONTRACTOR USE

The use of contractors at LACBWR will continue as required throughout the SAFSTOR and DECON periods. The use of contractors will complement areas where DPC expertise or staffing is inadequate to perform specific tasks. Contractor employment during the SAFSTOR and DECON periods will continue to be governed by the requirements of the QAPD. Contractors will be selected in each case on a basis of ability, price, past performance, and regulatory requirements.

DPC will retain full responsibility for the performance of contractor tasks and will provide the supervision necessary to ensure that the tasks performed by contractors are in full compliance with the QAPD, the purchase agreement, and other appropriate regulations.

6.4 TRAINING PROGRAM

6.4.1 Training Program Description

6.4.1.1 LACBWR has established General Employee Training (GET) requirements for all personnel who may be assigned to perform work at LACBWR.

6.4.1.2 In addition to GET, programs have been designed to initially qualify personnel, and maintain their proficiency, in the following areas:

a) Health Physics Technician (HPT)

b) Operator

c) Certified Fuel Handler (CFH)

6.4.1.3 Special infrequently performed evolutions relating to decommissioning activities may be included for training as they approach. These evolutions may typically be:

a) Cask Handling

b) Systems Internals and Equipment Decontamination and Dismantling

c) Special Tests

d) Any other evolution determined by plant management to require special training.

6.4.2 <u>General Employee Training (GET)</u>

6.4.2.1 All personnel either assigned to LACBWR, or who may be assigned duties at LACBWR, will receive GET commensurate with their assignment. This training will include, as appropriate:

a) Emergency Plan Training
b) Security Plan Training
c) Radiation Protection Training
d) Quality Assurance Training
e) Respiratory Protection Training
f) Industrial Safety, First Aid, and Fire Protection

6.4.3 <u>Technical Training</u>

The following areas consist of a formal initial training program, followed by a recurring continuing training program.

6.4.3.1 The Health Physics Technician (HPT) Initial Training Program consists of the following topics:

a) <u>Science Training</u>

   (1) Nuclear Theory
   (2) Chemistry

      (a) Non-radiological
      (b) Radiochemistry

   (3) Radiological Protection and Control (including surveys)

b) <u>Systems Training</u>

   (1) Effluent Systems Sampling and Control

c) <u>Emergency Plan Training</u>

   (1) Onsite Survey Team Member
   (2) Nearsite Survey Team Member
   (3) Duty HP
   (4) Re-entry Team Members
   (5) PASS Sampling
   (6) Medical Emergency

d) Environmental Program

e) Waste Disposal

f) Personnel Monitoring, including Internal Deposition Counting

g) Respiratory Protection Program

h) Radiation Monitoring and Instrumentation

i) Administrative Requirements

j) First Aid Training

6.4.3.2 The Health Physics Technician (HPT) Continuing Training Program consists of the following:

a) The program will be of 12-month duration, and will be repeated each 12 months.

b) Health and Safety management will review significant industry events and distribute, as required reading to all technicians, those events determined to be applicable to LACBWR HPT's.

c) Health and Safety management will review LACBWR events and distribute, as required reading to all technicians, those events determined to be relevant and significant.

d) Emergency Plan Training commensurate with duties.

e) Procedure changes will be reviewed by Health and Safety management and those determined to be relevant to the performance of a technician's duties will be distributed as required reading.

f) The Health and Safety/Maintenance Supervisor may initiate additional training for the technicians at any time. This training could be for, but not limited to, any of the following:

(1) Equipment upgrade/replacement.
(2) Infrequent and/or important tasks.
(3) Significant procedure or department policy changes.
(4) Significant performance problems.

g) The Health and Safety/Maintenance Supervisor will ensure all Journeyman Technicians successfully complete the HP continuing training. Records of satisfactory completion will be maintained by Health and Safety management. The continuing training will cover the following topics.

(1) Intralaboratory comparisons in radio-chemistry (crosscheck analysis).

(2) Emergency Plan training.

h) A meeting will be conducted, at least semiannually, by the Health and Safety/Maintenance Supervisor for all technicians for the purpose of discussing any pertinent information on the following topics:

(1) Significant Plant/Industry events.

(2) Equipment Changes.

(3) Management/Technician Concerns.

(4) Performance Problems.

Minutes of these meetings will be taken.

6.4.3.3 Operator Training Program

(1) Operators assigned to LACBWR will be qualified to perform the duties of Auxiliary Operator (AO) and Control Room Operator (CRO).

(2) The Operator Initial Training Program consists of the following:

(a) Part I - The initial GET and Indoctrination is presented to give the new employee background information concerning the LACBWR organization, radiation safety, payroll practices, and general plant description and administration.

(b) Part II - The second part of the training program, "Initial Plant Qualification Program," provides a comprehensive outline of material considered necessary for the training of individuals to qualify them for all operator duties. Periodic written and/or oral examinations, plus actual demonstrations of proficiency in practical factors, will be required of the trainees to determine their progress in the program.

(c) Operator Sciences Training

(1) Nuclear Theory
(2) Radiological Protection and Control
(3) Electrical Theory, as applied to operators
(4) Chemistry

(d) Operator Systems Training

(1) Plant Specific Systems
(2) Design Bases
(3) Flow Paths
(4) Components
(5) Instrumentation and Control
(6) Operational Aspects

(e) Control Room Training by familiarization and manipulation under the supervision of a qualified CRO, consisting of training and exercises which apply the operating philosophy, procedures, and attitudes needed as an operator at LACBWR. The Control Room Training will be documented in the operator Practical Factors Record.

Topics include:

(1) Normal operations
(2) Malfunctions
(3) Surveillances
(4) Procedures
(5) Technical Specifications
(6) Emergency response actions

(f) Emergency Training

(1) Emergency Plan and EPP's
(2) Plant Emergency Procedures
(3) Review of Incident Reports and LER's

(g) In addition, operator trainees will take part in the LACBWR Continuing Training Program when assigned to an operating crew. This program is intended as a review for personnel and as such is not intended to serve as the sole means of training for operator trainees. All quiz and examination scores attained by trainees in the requalification program will be used to aid the trainee and not to determine his status in the program. No lecture attendance or retraining requirements are to be based on test results.

(h) The candidate will normally get the necessary signatures for the Auxiliary Operator Watch Card, then Control Room Operator Watch Card and, while standing these watches, work to complete each Progress Card. As the Progress Cards are completed, the training personnel shall prepare and administer a written exam. The trainee must receive a score of $\geq 80\%$ to pass exam.

6.4.3.4 Certified Fuel Handler Training Program. A training and certification program has been implemented to maintain a staff properly trained and qualified to maintain the spent fuel, to perform any fuel movements that may be required, and to maintain LACBWR in accordance with the possession-only license. This program provides the training, proficiency testing, and certification of fuel handling personnel. A detailed description of the Certified Fuel Handler (CFH) Program is provided in Section 10.

The Operator Training and Certification Programs ensure that people trained and qualified to operate LACBWR will be available during the SAFSTOR period. Licensee certification of personnel makes it unnecessary for the NRC to periodically conduct license examinations for persons involved in infrequent activities and prevents delays due to obtaining NRC Fuel Handler Licenses for any evolutions that may require fuel movements.

6.4.4 Other Decommissioning Training

It is anticipated that other technical topics will be presented to personnel on an as-needed basis. Current administrative guidelines will be followed to establish new procedures and to ensure the training is completed.

6.4.5 Training Program Administration and Records

The LACBWR Plant Manager is responsible for ensuring that the training requirements and programs are satisfactorily completed for site personnel. The Operations, Training/Relief Supervisor is responsible for the organization and coordination of training programs, for ensuring that records are maintained and kept up-to-date, and assisting in training material preparation and classroom instruction.

6.5 QUALITY ASSURANCE

Decommissioning and SAFSTOR activities will be performed in accordance with the NRC-approved Quality Assurance Program Description (QAPD) for LACBWR. Safety Related as defined in 10 CFR 50.2 is no longer applicable in the possession-only mode of operation and, therefore, Quality Assurance criteria of 10 CFR 50, Appendix B, no longer apply to activities performed at LACBWR.

Because of DPC's desire to maintain control and continuity in activities performed at and for LACBWR, including spent fuel storage and radioactive waste shipments, the QAPD addresses all 18 criteria of 10 CFR 50, Appendix B, but some are of a reduced scope.

A graded approach is used to implement this program by establishing managerial and administrative controls commensurate with the complexity and regulatory requirements of the activities undertaken.

Scheduled activities during SAFSTOR shall be performed within schedule intervals. A schedule interval is a time frame within which each scheduled activity shall be performed, with a maximum allowable extension not to exceed 25 percent of the schedule interval.

6.6 SCHEDULE

The current schedule for decommissioning activities at LACBWR is depicted in Figure 6.2. Following final reactor shutdown in April 1987, the transition from operating plant to possession-only facility required numerous administrative changes. Staff level was reduced, license required plans were revised, and operating procedures were curtailed or simplified as conditions and NRC approval allowed. The LACBWR Decommissioning Plan was approved in August 1991, and the facility entered the SAFSTOR mode. License renewal granted at the same time accommodated the proposed SAFSTOR period for a term to expire March 29, 2031.

To make better use of resources during the SAFSTOR period, some incremental decontamination and dismantlement activities were desirable. By Confirmatory Order from the NRC in 1994, changes in the facility meeting 10 CFR 50.59 requirements were permitted and limited gradual dismantlement progressed. As of November 2008, approximately 2 million pounds of material related to the removal of unused components or whole systems, completed in over 100 specific approved changes to the facility, have been reprocessed or disposed of as dry active waste. This total does not include reactor vessel and B/C waste disposal.

For decommissioning funding assurance, scheduled DECON had been planned to occur in 2019 and was assumed to be a 7-year project. To date, accumulated decommissioning funds are projected to be sufficient to cover the current decommissioning cost estimate. A possibility exists that DECON may occur earlier. The early start to DECON and a period for License Termination Plan completion are shown on Figure 6.2.

The 2-year Reactor Pressure Vessel Removal (RPV) Project was completed in June 2007 with disposal of the intact RPV at the Barnwell Waste Management Facility (BWMF). Disposal of the RPV was completed at this time prior to the planned closing of BWMF to out-of-compact waste in July 2008. RPV removal was not specifically addressed in the original decommissioning schedule. The removal of this large component, as defined in 10 CFR 50.2, was an activity requiring notice be made pursuant to 10 CFR 50.82, Termination of License, (a)(7). This notice was made by submittal to the NRC on August 18, 2005. Section 7.6 describes the RPV Removal Project in greater detail.

The original schedule indicated that during the SAFSTOR period, DPC expected to ship the activated fuel to a federal repository, interim storage facility, or licensed temporary monitored retrievable storage facility. The timing of this action would be dependent on the availability of these facilities and their schedule for receiving activated fuel. In 2007, DPC began efforts to place an Independent Spent Fuel Storage Installation (ISFSI) on-site. As it is titled, the Dry Cask Storage Project has a planned duration of 3 years and is shown on Figure 6.2. An on-site ISFSI is the available option that provides flexibility for license termination of the LACBWR facility.

With respect to the federal repository option, a marker for transport of spent fuel to Yucca Mountain has also been added to Figure 6.2 as best available information can provide.

As to another option, DPC is a part of the consortium of utilities that formed the Private Fuel Storage (PFS) Limited Liability Company for the sole purpose of developing a temporary site for the storage of spent nuclear fuel for the industry. The Nuclear Regulatory Commission issued Materials License No. SNM-2513 pursuant to 10 CFR 72, dated February 21, 2006, for the PFS Facility.

At the time of the original Decommissioning Plan in 1987, DPC anticipated the plant would be in SAFSTOR for a 30-50 year period. Since then regulatory guidance has improved and progress in dismantlement at LACBWR has been substantial. B/C waste and RPV disposal have been successfully completed giving momentum to further planning for the final disposition of LACBWR. Development of the Dry Cask Storage Project brings license termination more clearly into focus.

6.7 SAFSTOR FUNDING AND DECOMMISSIONING COST FINANCING

6.7.1 SAFSTOR Funding

Pursuant to 10 CFR 50.54(bb), Dairyland Power Cooperative (DPC) has promulgated the following SAFSTOR spent fuel management and funding plan for LACBWR.

Independent of funding costs for SAFSTOR, DPC has established a Decommissioning Trust Fund and reports annually to the Nuclear Regulatory Commission the status of the fund. DPC understands that none of the funds in the Decommissioning Trust Fund may be used for spent fuel removal or for developing an Independent Spent Fuel Storage Facility (ISFSI). DPC has no plans to use any of the Decommissioning Trust Fund for an ISFSI or for spent fuel removal purposes.

DPC continues to fund the expense of SAFSTOR activities, including fuel storage costs, from the annual operating and maintenance budget. As part of generation expenses, SAFSTOR costs are recovered in rates that DPC charges distribution cooperative members under long-term, all requirements wholesale power contracts. DPC's rates to member cooperatives are annually submitted to the United States Rural Utilities Service (RUS) as part of RUS oversight of DPC operations. DPC is required by RUS lending covenants and RUS regulations to set rates at levels sufficient to recover costs and to meet certain financial performance covenants. DPC has always met those financial performance covenants and has satisfied the RUS regulations concerning submission and approval of its rates.

DPC's 25 member cooperatives set their own rates through participation in the DPC board of directors. The operations and maintenance budget approved by the DPC Board, and incorporated into rates submitted to and approved by the RUS, will be funded and available to pay SAFSTOR expenses as incurred.

DPC has found no need to separately fund SAFSTOR costs outside the regular operating and maintenance budget. SAFSTOR costs are relatively small compared to DPC's annual O&M costs for generation and transmission facilities, and DPC has continued the long-standing policy of recovering SAFSTOR costs as part of regular rates. DPC has seen no need to change the funding plan for SAFSTOR under those circumstances.

In August 2007, the DPC Board of Directors authorized to proceed with a dry cask storage project, including the planning, engineering and licensing, and construction and operation of an onsite ISFSI for the LACBWR spent fuel. Funds for ISFSI construction and operation will be generated through DPC operating and maintenance budgets. DPC does not intend to use any funds from the Decommissioning Trust Fund for dry cask storage purposes.

DPC's annual budget for operating and maintenance activities at LACBWR accommodates SAFSTOR activities and includes funds for performing limited dismantlement at the LACBWR facility. Accomplishing limited dismantlement activities during SAFSTOR reduces the amount that will ultimately be necessary for decommissioning LACBWR after removal of the fuel. This approach takes advantage of the collective experience and familiarity of the LACBWR staff with the plant, and builds further conservatism into the funding plan for ultimate decommissioning of the facility.

6.7.2 Decommissioning Cost Financing

In late 1983, the Dairyland Power Cooperative Board of Directors resolved to provide resources for the final dismantlement of LACBWR. DPC began making deposits to a decommissioning fund in 1984. The Dairyland Power Cooperative Nuclear Decommissioning Trust (DPC—NDT) was established in July 1990 as an external fund outside DPC's administrative control holding fixed income and equity investments. The DPC—NDT, with requisite funding and accumulated earnings, was established to assure adequate funds would be available for the final decommissioning cost of LACBWR.

The cost of DECON was based on the selection of total radiological cleanup as the option 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, 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.

An improved site-specific decommissioning cost study was performed by Sargent & Lundy (S&L) in 1994 and provides basis for the current 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, DPC—NDT funds were approximately $83.4 million. DPC—NDT funds for B/C waste and RPV removal, 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.

Cooperative management believes that the balance in the nuclear decommissioning funds, together with future expected investment income on such funds, will be sufficient to meet all future decommissioning costs.

The DPC Board of Directors remains committed to assuring that adequate funding will be available for the final decommissioning of the LACBWR facility and is prepared to take such actions as it deems necessary or appropriate to provide such assurance, based upon its review of the most recent decommissioning cost estimate and other relevant developments in this area.

Every five years during the SAFSTOR period, a review of the decommissioning cost estimate will be performed in order to assure adequate funds are available at the time final decommissioning is performed.

6.8 SPECIAL NUCLEAR MATERIAL (SNM) ACCOUNTABILITY

The LACBWR Accountability Representative is the person responsible for the custodial control of all SNM located at the LACBWR site and for the accounting of these materials. The representative is appointed in writing by the Dairyland Power Cooperative President & CEO.

The LACBWR spent fuel inventory is stored underwater in two-tiered storage racks within the Fuel Element Storage Well located in the Reactor Building. Additional small quantities of SNM are contained in neutron and calibration sources, which are appropriately stored at various locations in the LACBWR plant.

All fuel handling and all shipment and receipt of SNM are accomplished according to approved written procedures. Appropriate accounting records will be maintained and appropriate inventories, reports and documentation will be accomplished by or under the direction of the LACBWR Accountability Representative in accordance with the requirements set forth in 10 CFR 70, 10 CFR 72, 10 CFR 73, and 10 CFR 74.

6.9 SAFSTOR FIRE PROTECTION

6.9.1 Fire Protection Plan

LACBWR can safely maintain and control the Fuel Element Storage Well in the case of the worst postulated fire in each area of the plant.

The fire protection plan at LACBWR is to prevent fire, effectively respond to fire, and to minimize the risk to the public from fire emergencies. The goals of the fire protection plan are fire prevention and fire protection. This fire protection plan, implemented through the fire protection program, provides defense-in-depth to fire emergencies and addresses the following objectives:

- **Prevent fires.** By administratively controlling ignition sources, flammable liquid inventory, and combustible material accumulation, fire risk is reduced. Welding and other hot work shall be performed only under Special Work Permit conditions and the use of a fire watch shall be required. Routine fire and safety inspections by LACBWR staff shall be conducted to ensure flammable liquids are properly stored and combustible material is removed. These inspections shall also require identification of fire hazards and result in action to reduce those hazards. General cleanliness and good housekeeping shall continue as an established practice and shall be checked during inspection.

- **Rapidly detect, control, and extinguish fires that do occur and could result in a radiological hazard.** Fire detection systems are installed to detect heat and smoke in spaces and areas of the protected premises of LACBWR. If fire detection systems or components are unavailable, increased monitoring of affected areas by personnel shall compensate for any loss of automatic detection. Fire barriers provide containment against the spread of fire between areas and provide protection to personnel responding to fire emergencies. Areas of high fire loading are provided with automatic reaction-type fire suppression systems or manually initiated fire suppression systems. These installed systems provide immediate fire suppression automatically or provide the means to extinguish fires without fire exposure to personnel manually initiating them. Manual fire extinguishing equipment is installed in all areas of the LACBWR facility. All fire protection equipment and systems are maintained, inspected, and tested in accordance with established guidelines. Compensatory actions and procedures for the impairment or unavailability of fire protection equipment are provided. A trained fire brigade, available at all times shall respond immediately to all fire emergencies. The function of the response by the fire brigade shall be to evaluate fire situations, to extinguish incipient stage fires, and to quickly realize the need for, and then summon, outside assistance. For any situation where a fire should progress beyond the incipient stage, qualified outside fire services shall provide assistance.

- **Minimize the risk to the public, environment, and plant personnel resulting from fire that could result in a release of radioactive materials.** Surface contamination has been reduced to minimal levels in most areas of the facility by cleanup efforts and the effects of long-term decay. Contamination surveys are performed routinely and areas identified for attention are deconned further. Good radiological work practices and contamination control are maintained. Radioactive waste generated is containerized and shipped for processing in accordance with approved procedures. Liquid effluents are collected in plant drain systems, processed, and monitored during discharge. Plant personnel are alerted to elevated radioactivity levels by area radiation monitors and air monitoring systems that are in operation at all times in buildings of the radiological controlled area. Gaseous and particulate air activities are continuously monitored prior to their release to the environment. Procedures and protocols exist to ensure risk is minimized to the public and members of the outside fire service.

6.9.2 Fire Protection Program

The fire protection program for the LACBWR facility is based on sound engineering practices and established standards. The function of the fire protection program is to provide the specific mechanisms by which the fire protection plan is implemented. The fire protection program utilizes an integrated system of administrative controls, equipment, personnel, tests, and inspections. Components of the fire protection program are:

6.9.2.1 Administrative Controls are the primary means by which the goal of fire prevention is accomplished. Administrative controls also ensure that fire protection program document content is maintained relevant to its fire protection function. By controlling ignition sources, combustible materials, and flammable liquids, and by maintaining good housekeeping practices, the probability of fire emergency is reduced. Procedures are routinely reviewed for adequacy and are revised as conditions warrant.

6.9.2.2 Fire Detection System. The LACBWR plant fire detection system is designed to provide heat and smoke detection. A Class B protected premises fire alarm system is installed which uses ionization or thermal-type fire detectors. Detectors cover areas throughout the plant and outlying buildings. The plant fire alarm system control panel is located in the Control Room. Alarms as a result of operation of a protection system or equipment, such as water flowing in a sprinkler system, the detection of smoke, or the detection of heat, are sounded in the Control Room. Alarm response is initiated from the Control Room.

The Administration Building fire detection system provides alarm functions using a combination of thermal detectors ionization detectors, and manual pull stations. Audible alarms are sounded throughout the building and provide immediate notice to occupants of fire emergency. The control panel for the Administration Building fire detection system is located within the Security Electrical Equipment Room.

6.9.2.3 Fire Barriers are those components of construction (walls, floors, and doors) that are rated in hours of resistance to fire by approving laboratories. Any openings or penetrations in these fire barriers shall be protected with seals or closures having a fire resistance rating equal to that of the barrier. The breaching of fire barriers is administratively controlled to ensure their fire safety function is maintained.

6.9.2.4 Fire Suppression Water System. The fire suppression water system is designed to provide a reliable supply of water for fire extinguishing purposes in quantities sufficient to satisfy the maximum possible demand. Fire suppression water is supplied by the High Pressure Service Water System (HPSW) which is normally pressurized from the Low Pressure Service Water (LPSW) system. Two HPSW diesel pumps provide fire suppression water when started manually or when started automatically by a decrease in HPSW pressure to <90 psig for HPSW Diesel Pump 1A or <80 psig for HPSW Diesel Pump 1B. Fire suppression water can be supplied from Genoa Unit 3 as a backup system to the HPSW system.

Fire suppression water is available from an external underground main at five 6-inch fire hydrants spaced at 200-foot intervals around the plant. Four outside hose cabinets contain the necessary hoses and equipment for hydrant operation.

Fire suppression water is available at five hose cabinets in the Turbine Building, one hose reel in the 1B Diesel Generator Building, and one hose cabinet in the Waste Treatment Building. Fire suppression water is available from hose reels located on each of four levels in the Reactor Building.

Fire suppression water is also supplied to sprinkler systems in areas with high fire loads. Sprinkler systems suppress fire in these areas without exposure to personnel. Automatic sprinkler systems are installed in the Oil Storage Room and in the Crib House HPSW diesel pump and fuel tank area. A manually initiated sprinkler system is installed in 1A Diesel Generator Room. An automatic reaction-type deluge system protects the Reserve Auxiliary Transformer located in the LACBWR switchyard.

6.9.2.5 Automatic Chemical Extinguishing Systems are installed in two areas of LACBWR containing high fire loads. The 1B Diesel Generator Room is protected by a CO_2 Flooding system. The Administration Building Records Storage Room is protected by a Halon system. These systems automatically extinguish fire using chemical agents, upon detection by their associated fire protection circuits. Fire in these areas is extinguished without exposure to personnel.

6.9.2.6 Portable Fire Extinguishers and Other Fire Protection Equipment. An assortment of dry chemical, CO_2, and Halon portable fire extinguishers rated for Class A, B, and C fires are located throughout all areas of the LACBWR facility. These extinguishers provide the means to immediately respond to incipient stage fires. Spare fire extinguishers are located on the Turbine Building grade floor.

Portable smoke ejectors are provided for the removal of smoke and ventilation of spaces. Smoke ejectors are located in the Change Room, on the Turbine Building mezzanine floor, and in the Maintenance Shop.

Four outside hose cabinets contain necessary lengths and sizes of fire hose for use with the yard fire hydrants. These hose cabinets also contain hose spanner and hydrant wrenches, nozzles, gate valves, coupling gaskets, and ball-valve wye reducers.

Tool kits are located in the Crib House outside fire cabinet and in the Maintenance Shop. Spare sprinkler heads and other sprinkler equipment is located in the Change Room locker. Rechargeable flashlights are wall-mounted in various locations and at entries to spaces. Portable radios are available at various locations and used for Fire Brigade communication.

6.9.2.7 The Fire Brigade is an integral part of the fire protection program. The Fire Brigade at LACBWR shall be organized and trained to perform incipient fire fighting duties. Personnel qualified to perform Operations Department duties and all LACBWR Security personnel shall be designated as Fire Brigade members and trained as such. Fire Brigade responsibilities shall be assigned to members of these groups while on duty.

The Fire Brigade shall be a minimum of two people at all times. The Duty Shift Supervisor (or his designee) shall respond to the fire scene as the Fire Brigade Leader. One member of the Security detail shall respond, as directed by the Fire Brigade Leader, and perform duties as the second Fire Brigade member.

The Control Room Operator shall communicate the status of fire detection system alarms or specific hazard information with the Fire Brigade, shall monitor and maintain fire header water pressure, and shall expeditiously summon outside fire service assistance as directed by the Fire Brigade Leader. The Control Room Operator shall use the page system to announce reports of fire, evacuation orders, and other information as requested by the Fire Brigade Leader.

6.9.2.8 Outside Fire Service Assistance. The LACBWR Fire Brigade is organized and trained as an incipient fire brigade. Fire Brigade Leaders are responsible for recognizing fire emergencies that progress beyond the limits of incipient stage fire fighting. Fire Brigade Leaders shall then immediately request assistance from outside fire services.

The LACBWR Emergency Plan contains a letter of agreement with the Genoa Fire Department. This letter of agreement states that the Genoa Fire Department is responsible for providing rescue and fire fighting support to LACBWR during emergencies. Upon request by the Genoa Fire Chief, all fire departments of Vernon County can be coordinated and directed to support the Genoa Fire Department during an emergency at LACBWR.

6.9.2.9 Reporting. Fire emergencies shall be documented under the following reporting guidelines:

- Any fire requiring Fire Brigade response shall be reported by the Duty Shift Supervisor using a LACBWR Incident Report.
- Any incident requiring outside fire service assistance within the LACBWR Site Enclosure (LSE fence) shall require activation of the Emergency Plan and shall require declaration of Unusual Event.

6.9.2.10 Training. Security badged visitors and contractors located at LACBWR shall receive indoctrination in the areas of fire reporting, plant evacuation routes, fire alarm response, and communications systems under General Employee Training.

Personnel who work routinely at LACBWR, and are given basic practical fire fighting instruction annually, are termed designated employees.

In addition to the annual practical fire fighting instruction, Fire Brigade members shall receive specific fire protection program instruction and participate in at least one drill annually.

Personnel not subject to Fire Brigade responsibilities shall receive training prior to performing fire watch duties.

6.9.2.11 Records. Fire Protection records shall be retained in accordance with Quality Assurance records requirements.

6.10 SECURITY DURING SAFSTOR AND/OR DECOMMISSIONING

During the SAFSTOR status associated with the LACBWR facility, security will be maintained at a level commensurate with the need to ensure safety is provided to the public from unreasonable risks.

Guidance and control for security program implementation are found within the LACBWR Security Plan, Safeguards Contingency Plan, Security Force Training and Qualification Plan, Security Control Procedures, Fitness for Duty Program, Unescorted Access Authorization Program, and Behavior Observation Program. The Security Plan for Transportation of LACBWR Hazardous Materials is found in the Process Control Program.

6.11 TESTING AND MAINTENANCE OF SAFSTOR SYSTEMS

Testing and maintenance continues for those systems designated as being required for SAFSTOR. Routine preventive maintenance is performed at specified intervals. Corrective maintenance is performed when identified as necessary. Instrument calibrations and other routine testing continue at specified intervals for equipment required to be operable during SAFSTOR.

The LACBWR Maintenance Rule Program implements requirements of 10 CFR 50.65. The program identifies structures, systems, and components (SSCs) to be monitored under the rule, establishes goals for those SSCs, and provides a process for corrective action implementation for failure of identified SSCs.

6.12 PLANT MONITORING PROGRAM

Activities and plant conditions at LACBWR will continue to be maintained to protect the health and safety of both the public and plant workers. Baseline radiation surveys have been performed to establish the initial radiological conditions at LACBWR during SAFSTOR. An in-plant, as well as surrounding area, surveillance program will be established and maintained to assure plant conditions are not deteriorating and environmental effects of the site are negligible.

6.12.1 Baseline Radiation Surveys

Baseline surveys have been performed to establish activity levels and nuclide concentrations throughout the plant and surrounding area. These surveys included:

a) Specific area dose rates and contamination levels.

b) Specified system piping and component contact dose rate.

c) Radionuclide inventory in specified plant systems.

d) Radionuclide concentration in the soil and sediment in close proximity of the plant.

Baseline conditions will be compared with routine monitoring values to determine the plant/system trends during SAFSTOR. Some specific monitoring points may be reassigned during the SAFSTOR period if it is determined that a better characterization can be obtained based on radiation levels measured or due to decontamination or other activities which are conducted and experience achieved.

6.12.2 In-Plant Monitoring

Routine radiation dose rate and contamination surveys will be taken of plant areas along with more specific surveys needed to support activities at the site. A pre-established location contact dose rate survey will be routinely performed to assist in plant radionuclide trending. These points are located throughout the plant on systems that contained radioactive liquid/gases during plant operation.

6.12.3 Release Point/Effluent Monitoring

During the SAFSTOR period, effluent release points for radionuclides will be monitored during all periods of potential discharge, as in the past. The two potential discharge points are the stack and the liquid waste line.

a) Stack - the effluents of the stack will be continuously monitored for particulate and gaseous activity. The noble gas detector(s) have been recalibrated to an equivalent Kr-85 energy. The stack monitor will be capable of detecting the maximum Kr-85 concentration postulated from any accident during the SAFSTOR period. Filters for this monitor will be changed and analyzed for radionuclides on a routine basis established in the ODCM.

b) Liquid discharge - the liquid effluents will be monitored during the time of release. Each batch release will be gamma analyzed before discharge to ensure ODCM requirements will not be exceeded.

All data collected concerning effluent releases will be maintained and will be included in the annual effluent report.

6.12.4 Environmental Monitoring

Surrounding area dose rates as well as fish, air, liquid, and earth samples will continue to be taken and analyzed to ensure the plant is not adversely affecting the surrounding environment during SAFSTOR. The necessary samples and sample frequencies will be specified in the ODCM.

All data collected will be submitted in the annual environmental report.

6.13 RECORDS

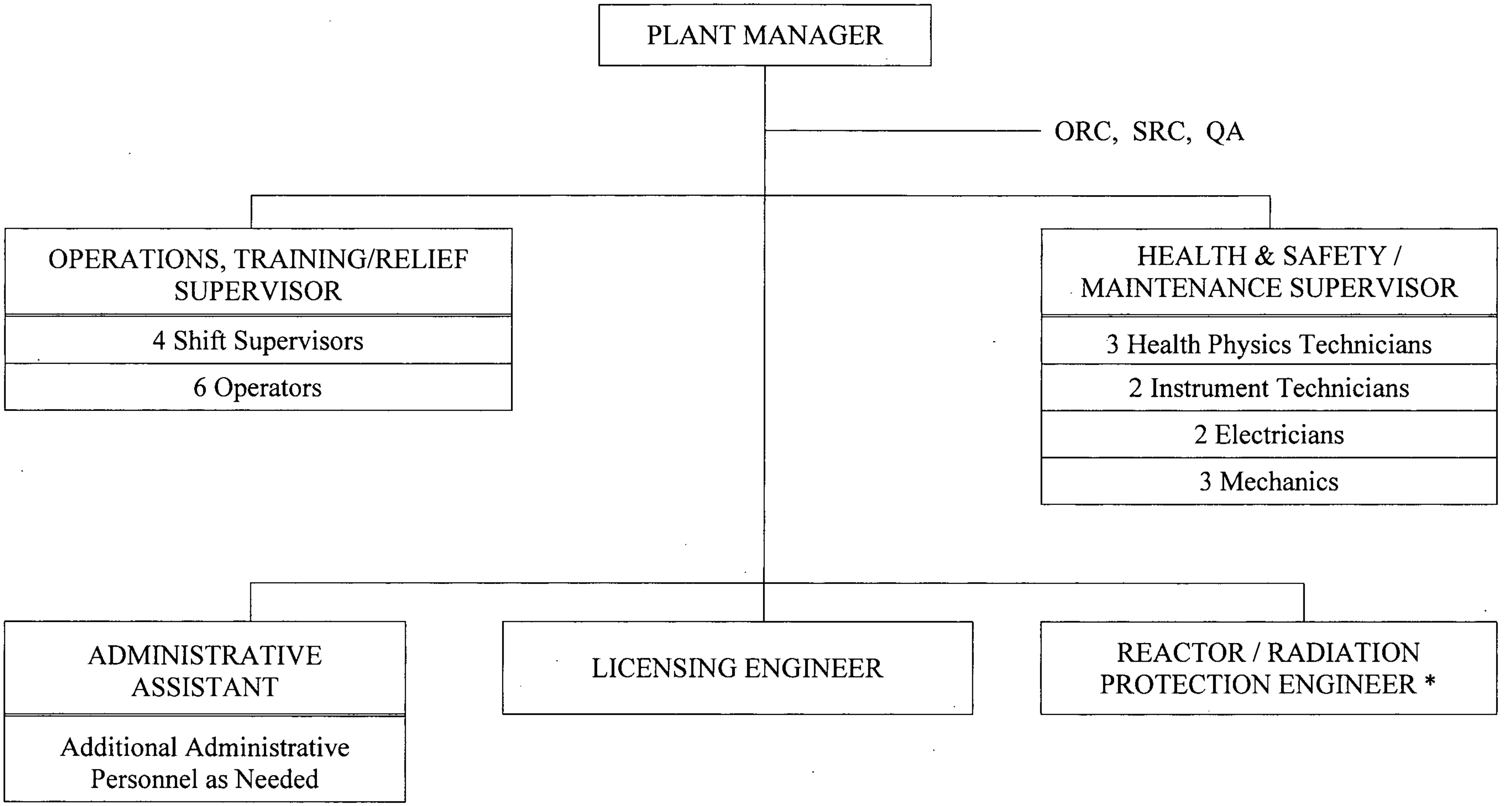
The Quality Assurance Program Description (QAPD) establishes measures for maintaining records which cover all documents and records associated with the decommissioning, operation, maintenance, repair, and modification of structures, systems, and components covered by the QAPD.

Any records which are generated for the safe and effective decommissioning of LACBWR will be placed in a file explicitly designated as the decommissioning file.

Examples of records which would be required to be placed in the decommissioning file are:

- Records of spills or spread of radioactive contamination, if residual contamination remains after cleanup.
- Records of contamination remaining in inaccessible areas.
- Plans for decontamination (including processing and disposal of wastes generated).
- Base line surveys performed in and around the LACBWR facility.
- Analysis and evaluations of total radioactivity concentrations at the LACBWR facility.
- Any other records or documents, which would be needed to facilitate decontamination and dismantlement of the LACBWR facility and are not controlled by other means.

LA CROSSE BOILING WATER REACTOR SAFSTOR STAFF



Assumes Cooperative-wide Security & QA

* Duties to be performed with assistance of qualified consultants when necessary.

FIGURE 6.1

8. HEALTH PHYSICS

During the SAFSTOR period of LACBWR, radiation protection and health physics programs will be provided to ensure the health and safety of LACBWR workers. The programs will also provide the necessary monitoring and control of radiological conditions to protect the health and safety of the general public and to ensure compliance with LACBWR license requirements. In addition, programs will be provided to maintain radiation exposures as low as reasonably achievable (ALARA).

8.1 ORGANIZATION AND RESPONSIBILITIES

The organization described below is the organization as it is expected to exist during the SAFSTOR activities. The organization may be changed slightly during the SAFSTOR period as staffing levels requirements change. Responsibilities assigned to a position which is deleted will be assigned to another individual in order to maintain continuity.

The LACBWR Plant Manager has the overall responsibility for all onsite activities including assurance that ALARA policies and the radiation protection program are carried out. He is the chairman of the ORC. He is also responsible for approving all plant procedures.

Health and Safety management shall provide the first-line supervision, training and technical assistance to the Health and Safety department. Management personnel will report directly to the Plant Manager. They shall assure that all ALARA policies and all aspects of the Radiation Protection Program are implemented. They shall also be members of the ORC. Health and Safety management will be responsible for all departmental budgeting and scheduling.

The Health Physics Technicians will perform chemical and radiological sampling, surveys and analysis as directed by Health and Safety management. In addition, they will also be responsible for conducting the personnel monitoring program, maintaining radiation protection records and monitoring work in progress within the radiologically restricted area.

8.2 ALARA PROGRAM

8.2.1 Basic Philosophy

The radiation exposure criteria set forth shall be for the protection of personnel against radiation hazards arising from work associated with LACBWR. As good practice, no person under 18 years of age shall be employed by DPC to be occupationally exposed to ionizing radiation. A continuous effort should be made to reduce levels of radiation and radioactivity in order to maintain radiation doses at the lowest achievable value below the established limits of 10 CFR 20.1201.

A further goal of the Health and Safety Procedures in use at LACBWR shall be to reduce personnel exposures to radiation and radioactive material to As Low As Reasonably Achievable (ALARA).

8.2.2 Application of ALARA

(1) To obtain the goal of ALARA, the Total Effective Dose Equivalent (TEDE) to be received during a specific job and the total allowable for the year for the entire operation of the facility should be balanced.

(2) The occupational dose received by an individual shall be considered with respect to his/her yearly internal and external accumulation. The individual's TEDE dose should be balanced with the TEDE dose received by the entire LACBWR work force including temporary DPC/contract employees to aid the overall ALARA program.

(3) An ALARA review may be conducted if the following thresholds are expected to be exceeded:

(a) Between 100 and 500 milliRem total collective deep dose equivalent (DDE) for performing a job.

(b) Potential intake greater than 50 DAC-HRS for an individual and respiratory devices are not planned to be used. An ALARA review form used for this application should be governed by total Person Rem and DAC-HR estimates, based upon current surveys and job-time estimates, and total Person Rem for past similar jobs based upon an SWP dose accountability file.

(4) An ALARA review shall be conducted if the following thresholds are expected to be exceeded:

(a) Greater than 500 milliRem collective DDE for performing a job.

(b) Potential intake greater than 100 DAC-HRS for an individual and respiratory devices are not planned to be used.

(5) Documentation of ALARA engineering work and cost benefits shall be maintained in files.

(6) Health and Safety management will conduct ALARA reviews of Actual versus Projected (goal) exposures. Person Rem exposures will be reviewed regularly with the Plant Manager. Included should be a review of the effectiveness of specific steps that were taken to reduce radiation exposure (ALARA Engineering).

8.2.3 Radiation Exposure Limits

(1) Daily Administrative Limit
An administrative guideline of 100 mRem per day will not be exceeded without the prior approval of the Health and Safety/Maintenance Supervisor or alternate. Assignment to an SWP by the Health and Safety/Maintenance Supervisor (or his authorized representative) will authorize an individual to exceed the 100 mRem per day administrative limit.

(2) Occupational Dose Limit Guideline
LACBWR will provide a guideline for the control of occupational dose to individual adults to the following annual limits. Any individual exceedance of these limits will require approval by the Plant Manager.

a) Total effective dose equivalent (TEDE) 2.5 Rem.

b) The sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 25 Rem.

c) An eye dose equivalent of 7.5 Rem

d) A shallow-dose equivalent of 25 Rem to the skin or to each of the extremities.

e) The dose received by an embryo/fetus during the entire pregnancy due to the occupational exposure of a declared pregnant worker shall not exceed 0.25 Rem (250 mRem).

(3) Occupational Dose Limit
LACBWR shall control the occupational dose to individual adults to the following annual limits. Any individual exceedance of these limits will require approval by the ORC.

a) Total effective dose equivalent (TEDE) less than 4 Rem.

b) The sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 40 Rem.

c) An eye dose equivalent of 12 Rem.

d) A shallow-dose equivalent of 40 Rem to the skin or to each of the extremities.

e) The dose received by an embryo/fetus during the entire pregnancy due to the occupational exposure of a declared pregnant worker shall not exceed 0.4 Rem (400 mRem).

If it is determined that any employee has a significant internal lung deposition of any isotope, the individual may be required to submit a urine and/or fecal specimen.

All personnel leaving a restricted area will be required to conduct a personnel contamination survey using the contamination detection instrument provided at the exit.

8.3.2 Respiratory Protection Program

A respiratory protection program will be maintained during the SAFSTOR period.

The Health and Safety/Maintenance Supervisor is responsible for the Respiratory Program at LACBWR. The Health and Safety/Maintenance Supervisor or designated alternate will evaluate the total job hazard, recommend engineering controls if appropriate, specify respiratory protection if control cannot be otherwise obtained and forbid the use of respirators if conditions warrant. The Health and Safety Department is responsible for the selection, care, and maintenance of all respiratory protection equipment that falls under the scope of the respiratory protection program.

The acceptable manner for limiting the internal exposure of personnel is to control radioactivity concentration in the air breathing zones. Whenever possible, this will be accomplished by the application of engineering control measures such as containment, decontamination, special ventilation equipment and design. The use of personal respiratory protective equipment as a primary control is undesirable and is acceptable only on a non-routine basis or in an emergency situation.

Equipment such as hoods, blowers, and filtered exhaust systems will be used to provide controls for routine operations and, whenever possible, for non-routine operations. In some cases, such controls may be inadequate or impractical and the use of protective breathing apparatus will be approved on a short-term basis.

The periods of time for which respirators may be worn continuously, and the overall time of uses, should be kept to a minimum. The wearer shall leave the area for relief from respirator use in case of equipment malfunction, undue physical or psychological discomfort, or any other condition that, in the opinion of the user, his supervisor or the Health and Safety Department, might cause significant reduction in the protection afforded the user.

Respiratory protection equipment will be issued to individuals only after documentation has been received that shows that the person has satisfactorily completed:

a) medical exam,

b) respiratory protection training, and

c) respiratory fit test (does not apply to in-line supplied air hoods and Self-Contained Breathing Apparatus).

The assumptions used in evaluating this event during SAFSTOR were similar to those used in the FESW reracking analyses.[1,2] The fuel inventory calculated for October 1987 was used. The only significant gaseous fission product available for release is Kr-85. The plenum or gap Kr-85 represents about 15% (215.7 Curies) of the total Kr-85 in the fuel assembly. However, for conservatism and commensurate with Reference 1, 30% of the total Kr-85 activity, or 431.4 Curies, is assumed to be released in this accident scenario. (Due to decay, as of October 2008 only 25.8% of the Kr-85 activity remains -- 111.1 Curies.)

No credit was taken for decontamination in the FESW water or for containment integrity, so all the activity was assumed to be released into the environment. Meteorologically stable conditions at the Exclusion Area Boundary (1109 ft, 338m) were assumed, with a release duration of two (2) hours commensurate with 10 CFR 100 and Regulatory Guides 1.24 and 1.25.

A stack release would be the most probable, but a ground release is not impossible given certain conditions. Therefore, offsite doses were calculated for 3 cases. The first is at the worst receptor location for an elevated release, which is 500m E of the Reactor Building. The next case is the dose due to a ground level release at the Exclusion Area Boundary. The maximum dose at the Emergency Planning Zone boundary[3] for a ground level release is also calculated. Adverse meteorology is assumed for all cases.

Elevated Release

Average Kr-85 Release Rate

$$\frac{431.4 \text{ Curies}}{2 \text{ hrs.} \times 3600 \text{ sec/hr}} = 6.00 \text{ E-2 Ci/sec}$$

Worst Case $\frac{X}{Q}$ for 0-2 hours at 500m E = 2.3 E-4 sec/m^3

Kr-85 average concentration at 500m E

$$6.00 \text{ E-2 Ci/sec} \times 2.3 \text{ E-4 sec/m}^3 = 1.38 \text{ E-5 Ci/m}^3$$

Immersion Dose Conversion at 500m E

Kr-85 Gamma Whole Body Dose Factor (Regulatory Guide 1.109)

$$1.61 \text{ E+1} \frac{\text{mRem/yr}}{\mu\text{Ci/m}^3} \times 10^6 \frac{\mu\text{Ci}}{\text{Ci}} \times 1.142 \text{ E-4} \frac{\text{yr}}{\text{hr}} = 1{,}839 \frac{\text{mRem/hr}}{\text{Ci/m}^3}$$

Whole Body Dose at 500m E

$$1839 \frac{\text{mRem/hr}}{\text{Ci/m}^3} \times 1.38 \text{ E-5 Ci/m}^3 \times 2 \text{ hr} = 0.05 \text{ mRem}$$ (as of 10/08 = 0.01 mRem)

Kr-85 Beta/Gamma Skin Dose Factor (Regulatory Guide 1.109)

$$1.34\ E+3\ \frac{\text{mRem/yr}}{\mu\text{Ci/m}^3}\ x\ \frac{10^6\ \mu\text{Ci}}{\text{Ci}}\ x\ 1.142\ E\text{-}4\ \frac{\text{yr}}{\text{hr}} = 1.53\ E5\ \frac{\text{mRem/hr}}{\text{Ci/m}^3}$$

Skin Dose at 500m E

$$1.53\ E5\ \frac{\text{mRem/hr}}{\text{Ci/m}^3}\ x\ 1.38\ E\text{-}5\ \text{Ci/m}^3\ x\ 2\,\text{hr} = 4.2\ \text{mRem (as of 10/08} = 1.1\ \text{mRem)}$$

Ground Level Release at EAB

Worst Case $\frac{X}{Q}$ for 2 hrs at 338m NE or 338m SSE using Regulatory Guide 1.25

2.2 E-3 $\frac{\text{sec}}{\text{m}^3}$

Whole Body Dose at 338m	Skin Dose at 339m
10/87 = 0.49 mRem	10/87 = 40.4 mRem
10/08 = 0.13 mRem	10/08 = 10.4 mRem

Ground Level Release at Emergency Planning Zone Boundary

Worst Case $\frac{X}{Q}$ for 2 hrs at 100m E

1.02 E-2 $\frac{\text{sec}}{\text{m}^3}$

Whole Body Dose at 100m E	Skin Dose at 100m E
10/87 = 2.25 mRem	10/87 = 187 mRem
10/08 = 0.58 mRem	10/08 = 48.2 mRem

As can be seen, the estimated maximum whole body dose is more than a factor of 30,000 below the 10 CFR 100 dose limit of 25 Rem (25,000 mRem) to the whole body within a 2-hour period.

9.3 SHIPPING CASK OR HEAVY LOAD DROP INTO FESW

This accident postulates a shipping cask or other heavy load falling into the Fuel Element Storage Well. Reference 1 stated that extensive local rack deformation and fuel damage would occur during a cask drop accident, but with an additional plate (installed during the reracking) in place, a dropped cask would not damage the pool liner or floor sufficiently to adversely affect the leak- tight integrity of the storage well (i.e., would not cause excessive water leakage from the FESW).

For this accident, it is postulated that all 333 spent fuel assemblies located in the FESW are damaged. The cladding of all the fuel pins ruptures. The same assumptions used in the Spent Fuel Handling Accident (Section 9.2) are used here. A total of 35,760 Curies of Kr-85 is released within the 2-hour period. The doses calculated are as follows. (Due to decay, as of Oct. 2008 only 25.8% of the Kr-85 activity remains – 9,212 Curies.)

Elevated Release

Whole Body Dose at 500m E	Skin Dose at 500m E
10/87 = 4.2 mRem	10/87 = 350 mRem
10/08 = 1.1 mRem	10/08 = 90.2 mRem

Ground Level Release at EAB

Whole Body Dose at 338m	Skin Dose at 338m
10/87 = 40.2 mRem	10/87 = 3.34 Rem
10/08 = 10.4 mRem	10/08 = 0.90 Rem

Ground Level Release at Emergency Planning Zone Boundary

Whole Body Dose at 100m E	Skin Dose at 100m E
10/87 = 186 mRem	10/87 = 15.6 Rem
10/08 = 47.9 mRem	10/08 = 4.0 Rem

As can be seen, the estimated maximum whole body dose is more than a factor of 400 below the 10 CFR 100 dose limit of 25 Rem (25,000 mRem) to the whole body within a 2-hour period.

9.7 LOSS OF OFFSITE POWER

This accident postulates a loss of offsite power. If both Emergency Diesel Generators and a High Pressure Service Water (HPSW) Diesel start, FESW cooling can be provided and adequate instrumentation is available to monitor FESW conditions from the Control Room. All that is needed is for an operator to cross-connect HPSW to the Component Cooling Water (CCW) coolers.

If an HPSW Diesel and 1B Emergency Diesel Generator start, FESW cooling can be provided. If 1A Emergency Diesel Generator (EDG) starts, but 1B does not, adequate cooling can be provided only if the essential buses are tied together.

If one or more EDG's start, but neither HPSW diesel starts, no ultimate heat sink for the FESW would be available. The consequences would be the same as in the Loss of FESW Cooling Event (Section 9.4).

If neither EDG can be started, neither FESW or CCW pump can run. The consequences again are the same as a Loss of FESW Cooling Event. Some instrumentation will be lost immediately and the rest will be lost if packaged uninterruptible power supplies (UPS) are depleted. The operator would have to check the FESW locally periodically.

As discussed in Section 9.4, the fuel pool heatup test conducted in 1993 indicated that the temperature of the pool water would stabilize at less than boiling. Therefore, no immediate action needs to be taken and sufficient time is available to take corrective actions to restore power.

9.8 SEISMIC EVENT

This accident postulates that a design basis earthquake occurs. The magnitude of the seismic event and damage incurred is the same as that assumed during the Systematic Evaluation Program (SEP) and the Consequence Study prepared as part of the SEP Integrated Assessment (References 4-7). The major concern of the previous evaluation was to safely shut down the plant and maintain adequate core cooling to prevent fuel damage. The focus now is to prevent damage to the fuel stored in the Fuel Element Storage Well.

Seismic analysis has shown the Reactor Building structure, LACBWR stack and Genoa Unit 3 stack are capable of withstanding the worst postulated seismic event at the LACBWR site. Reference 1 documented that the storage well, itself, the racks and the bottom-entry line between the check valves and the storage well can withstand the postulated loads.

The potential consequences of most interest due to a seismic event could include loss of all offsite and onsite power and a break in the FESW System piping. This event, therefore, can be considered as a combination of a Loss of Offsite Power Event (Section 9.7) and FESW Pipe Break (Section 9.5). As with these individual events, considerable time is available for response to a seismic event, with the FESW System pipe break requiring the earlier response. Access to the break location may be more difficult following a seismic event due to failure of other equipment in the plant. The time available, though, should be more than sufficient to initiate mitigating actions. (Refer to Section 9.5).

9.9 WIND AND TORNADO

This accident postulates that design basis high wind or tornado event occurs. The magnitude of the event and damage incurred is the same as that assumed during the Systematic Evaluation Program (SEP) and the Consequence Study prepared as part of the SEP Integrated Assessment (References 4-9). The major concern of the previous analyses was to ensure that adequate cooling of the reactor core was maintained. The focus now is to prevent damage to the fuel stored in the Fuel Element Storage Well.

The previous evaluations determined that the Reactor Building would withstand this event. The Turbine Building, Diesel Building, Cribhouse and Switchyard may be damaged. The probability of the LACBWR or Genoa Unit 3 stacks failing and impacting the Reactor Building was determined to be low enough that it need not be considered. Personnel outside the Reactor Building may not survive.

An opening in the steel and concrete exterior Reactor Building wall was created, then closed by installation of a weather-tight, insulated, roll-up, bi-parting door in November 2006. The Reactor Building opening (described in Section 4.2.1) and bi-parting door are depicted in Figures 4.6 and 4.7. The 50.59 Evaluation of this modification to the Reactor Building structure concluded that since the governing load case does not include wind loading, but does include seismic loading, the seismic event governs. If the Reactor Building bi-parting door is open, or the closed bi-parting door is breached during a wind or tornado event, there are no structures, systems, or components important to safety that could be impacted in a direct linear path by wind-driven material entering the Reactor Building opening. The FESW is on the opposite side of the Reactor Building from the opening and at a low oblique angle. If an impact with equipment were to occur from wind-driven material, the event is bounded by the FESW Pipe Break analysis (Section 9.5). If wind-driven material were to enter the FESW, the event is bounded by the analysis of the Shipping Cask or Heavy Load Drop into FESW event (Section 9.3). The aluminum FESW cover is typically installed during the short periods of time the Reactor Building is open providing a defense-in-depth feature against wind-driven material entering the FESW. The bi-parting door panels are designed to withstand a 25-psf Exposure "B" wind load. The original Reactor Building wall design was 20 psf external wind load. The modification to the Reactor Building does not result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component important to safety previously evaluated.

The potential plant consequence of primary concern is the loss of all offsite and onsite power. As discussed in Section 9.7, Loss of Offsite Power, considerable time is available before action must be taken to protect the fuel.

9.10 REFERENCES

1) NRC Letter, Ziemann to Linder, dated February 4, 1980.
2) NRC Letter, Reid to Madgett, dated October 22, 1975.
3) DPC Letter, Taylor to Document Control Desk, LAC-12377, dated September 29, 1987.
4) DPC Letter, Linder to Paulson, LAC-10251, dated October 11, 1984.
5) NRC Letter, Zwolinski to Linder, dated January 16, 1985.
6) DPC Letter, Linder to Zwolinski, LAC-10639, dated March 15, 1985.
7) NRC Letter, Zwolinski to Taylor, dated September 9, 1986.
8) DPC Letter, Taylor to Zwolinski, LAC-12052, dated January 14, 1987.
9) NRC Letter, Bernero to Taylor, dated April 6, 1987.
10) FC 37-06-34, Reactor Building Restoration Activities.

10. SAFSTOR OPERATOR TRAINING AND CERTIFICATION PROGRAM

10.1 INTRODUCTION

This program describes the training and certification for Operations Department personnel who as supervisors and operators are associated with the operation, surveillance, and maintenance of the La Crosse Boiling Water Reactor (LACBWR).

10.2 APPLICABILITY

LACBWR Technical Specifications require that all fuel handling shall be directly supervised by a Certified Fuel Handler. The following members of the plant staff attain certification, maintain qualification, and demonstrate proficiency in accordance with the Certified Fuel Handler Training Program:

- Shift Supervisors
- Control Room Operators
- Staff members appointed by the Plant Manager

Additional personnel assigned Operations Department responsibilities are required to maintain Certified Fuel Handler qualification.

10.3 INITIAL CERTIFICATION

Certification candidates shall participate in a training program covering the following topic areas:

a) Reactor Theory (as applicable to the storage and handling of spent fuel)

b) Spent Fuel Handling and Storage Equipment - Design and Operating Characteristics

c) Monitoring and Control Systems

d) Radiation Protection

e) Normal and Emergency Procedures

f) Administrative Controls applicable during the SAFSTOR period

Reactor Theory training will include characteristics of the stored spent fuel, subcritical multiplication, factors affecting reactivity and criticality, and the basis for fuel handling restrictions and procedures.

The design and operating characteristics will include training in the functions and use of fuel handling tools, cranes, the fuel element storage well, and pool service systems and equipment. Prior to shipments of spent fuel this training will include shipping casks, cask handling equipment, and procedures.

Monitoring and Control Systems will include training on the Fuel Element Storage Well monitoring systems and area radiation monitors.

Radiation protection training will include theory of radioactive emissions, control of radiation exposure, use of radiation detection and monitoring equipment, protective clothing and respiratory protection, and contamination control procedures. Training will emphasize the principles and practices associated with maintaining exposures as low as reasonably achievable (ALARA).

Normal and Emergency Procedure Training will include the Emergency Plan and any operations and emergency procedures associated with the operation of LACBWR systems and equipment during SAFSTOR. This area shall also include training in the handling and processing of radioactive wastes.

Administrative Control Training will include LACBWR Technical Specifications, Security Plan, Quality Assurance Program Description and plant administrative procedures associated with the operation, surveillance, and maintenance of LACBWR.

Training will be provided through a combination of classroom instruction, audio-visual instruction, self-study, and on-the-job training.

Satisfactory completion of the training shall be based on passing of a comprehensive written examination including each of the above areas and an oral examination. Minimum passing grade for the written examination shall be 70% in each area and 80% overall. The oral examination shall be administered by a member of the plant management staff. Results of the oral examination shall be on a pass/fail basis. Weaknesses noted as a result of the written or oral examination shall be documented and remedial training provided.

10.4 PROFICIENCY TRAINING AND TESTING

Proficiency training shall be used to maintain the qualification level of certified personnel. Proficiency training will include periodic training through the use of classroom training, audio/visual instruction, self-study assignments, and/or on-the-job training. Frequency and topics to be included in the proficiency training will depend on actual activities planned or in progress and identified weaknesses. As a minimum, training in the six areas included in the initial certification program shall be covered at least once every 2 years.

A biennial written examination, combined with an annual oral examination administered in those years when no written exam is given, shall be used to demonstrate the proficiency of certified personnel. Examinations will be similar to, but not as comprehensive as, the initial certification examinations. Minimum passing grade for proficiency examinations shall be 70% in each section and 80% overall. Oral examinations shall be on a pass/fail basis.

10.5 CERTIFICATION

Upon successful completion of the initial certification training program, the Plant Manager or his delegate shall certify the individual as a Certified Fuel Handler. Normally an employee will complete the initial certification within one year after entering the program. After initial certification, personnel will be recertified every two years based on the successful completion of the Proficiency Training and Testing Program

10.6 PHYSICAL REQUIREMENTS

As a prerequisite to acceptance into the training program and for recertification, a candidate must successfully pass a medical examination designed to ensure that the candidate is in generally good health and is otherwise physically qualified to safely perform the assigned work. Minor correctable health deficiencies, such as eyesight or hearing, will not per se prevent certification.

The medical examination will meet or exceed the requirements of ANSI Standard N546-1976, "American National Standard - Medical Certification and Monitoring of Personnel Requiring Operator Licenses for Nuclear Power Plants."

10.7 DOCUMENTATION

Initial Certification and Proficiency Training shall be documented and maintained for certified personnel while employed at LACBWR. The records shall include the dates of training, results of all quizzes and examinations, copies of written examinations, oral examination records, and information on results of physical examinations.

LAC-TR-138

LACBWR

INITIAL

SITE CHARACTERIZATION SURVEY

FOR SAFSTOR

By:

Larry Nelson
Health and Safety/Maintenance Supervisor

October 1995

Revised: December 2008

Dairyland Power Cooperative
3200 East Avenue South
La Crosse, WI 54601

ATTACHMENT 1

SPENT FUEL RADIOACTIVITY INVENTORY

Decay-Corrected to October 2008

Radionuclide	*Half Life (Years)*	*Activity (Curies)*	*Radionuclide*	*Half Life (Years)*	*(Curies)*
Ce-144	7.801 E-1	0.02	Sr-90	2.770 E + 1	6.81E+5
Cs-137	3.014 E+1	1.03 E+6	Pu-241	1.429 E+1	4.18E+5
Ru-106	1.008 E+0	0.9	Fe-55	2.700 E+0	2.50E+3
Cs-134	2.070 E+0	308	Ni-59	8.000 E+4	287
Kr-85	1.072 E+1	3.02E+4	Tc-99	2.120 E+5	276
Co-60	5.270 E+0	4.13E+3	Sb-125	2.760 E+0	1.46
Pm-147	2.620 E+0	167	Eu-155	4.960 E+0	9.14
Ni-63	1.000 E+2	3.06E+4	U-234	2.440 E+5	63.7
Am-241	4.329 E+2	1.43E+4	Am-243	7.380 E+3	61
Pu-238	8.774 E+1	1.07 E+4	Cd-113m	1.359 E+1	6.15
Pu-239	2.410 E+4	8.83E+3	Nb-94	2.000 E+4	15.9
Pu-240	6.550 E+3	7.15E+3	Cs-135	3.000 E+6	14.0
Eu-154	8.750 E+0	772	U-238	4.470 E+9	12.2
Cm-244	1.812 E+1	1.62E+3	Pu-242	3.760 E+5	8.58
H-3	1.226 E+1	170	U-236	2.340 E+7	6.32
Eu-152	1.360 E+1	177	Sn-121m	7.600 E+1	3.67
Am-242m	1.505 E+2	445	Np-237	2.140 E+6	2.19
			U-235	7.040 E+8	1.89
			Sm-151	9.316 E+1	1.3
			Sn-126	1.000 E+5	0.7
			Se-79	6.500 E+4	0.552
			I-129	1.570 E+7	0.39
			Zr-93	1.500 E+6	0.111

Total Activity = 2.24 E6 Curies

ATTACHMENT 2

CORE INTERNAL/RX COMPONENT RADIONUCLIDE INVENTORY

Components	Estimated Curie Content				
	Co-60	Fe-55	Ni-63	Other Nuclides $T_{1/2} > 5y$	Total
In Reactor					
Fuel Shrouds (72 Zr, 8 SS)					
Control Rods (29)					
Core Vertical Posts (52)					
Core Lateral Support Structure	REACTOR VESSEL WAS PROCESSED, PACKAGED AND DISPOSED OF IN 2007				
Steam Separators (16)					
Thermal Shield					
Pressure Vessel					
Core Support Structure					
Horizontal Grid Bars (7)					
Incore Monitor Guide Tubes					
Total					
In FESW					
Fuel Shrouds (24 SS)					
Fuel Shrouds (73 Zr)	"IN FESW" COMPONENTS LISTED WERE PROCESSED, PACKAGED AND DISPOSED OF IN 2006				
Control Rods (10)					
Start-up Sources (2)					

ATTACHMENT 3

PLANT SYSTEMS INTERNAL RADIONUCLIDE INVENTORY - OCTOBER 2008

Plant System	Nuclide Activity, in μCi				System Total μCi Content
	Fe-55	Alpha	Co-60	Cs-137	
CB Ventilation	10	--	118	108	236
Offgas - upstream of filter	*SYSTEM*	*REMOVED*			
Offgas - downstream of filters	*SYSTEM*	*REMOVED*			
TB drains	106	40	1,258	3,170	4,574
CB drains	236	3	2,812	1,521	4,572
TB Waste Water	22	7	266	76	371
CB Waste Water	1,304	79	15,540	1,458	18,381
Main Steam	1,614	290	19,240		21,144
Turbine	6	2	69	127	204
Primary Purification	552	12	6,586		7,150
Emergency Core Spray	*SYSTEM*	*REMOVED*			
Overhead Storage Tank	81	34	962	494	1,571
Seal Inject	10	4	118	35	167

ATTACHMENT 3

PLANT SYSTEMS INTERNAL RADIONUCLIDE INVENTORY – OCTOBER 2008 - (cont'd)

Plant System	Nuclide Activity, in µCi			System Total µCi Content
	Fe-55	Alpha	Co-60	
Decay Heat	476	490	6,488	7,454
Boron Inject	*SYSTEM*	*REMOVED*		
Reactor Coolant PASS	*SYSTEM*	*REMOVED*		
Alternate Core Spray	95	94	1,298	1,487
Shutdown Condenser	*SYSTEM*	*REMOVED*		
Control Rod Drive Effluent	714	720	9,732	11,166
Forced Circulation	7,142	7,000	97,323	111,465
Reactor Vessel and Internals	*SYSTEM*	*REMOVED*		
Condensate after beds & Feedwater	*SYSTEM*	*REMOVED*		
Condensate to beds	*SYSTEM*	*REMOVED*		

ATTACHMENT 3

PLANT SYSTEMS INTERNAL RADIONUCLIDE INVENTORY – OCTOBER 2008 - (cont'd)

Plant System	Nuclide Activity, in µCi				System Total µCi Content
	Fe-55	Alpha	Co-60	Cs-137	
Fuel Element Storage Well System	4,047	390	55,150		59,587
Fuel Element Storage Well - all but floor	6	5	84	2,854	2,949
Fuel Element Storage Well floor	123,795	7,600	1,686,940	25,439	1,843,774
Resin lines	619	100	8,435		9,154
Main Condenser	52,375	8,500	713,705		774,580