May 13, 2011

Mr. W. L. Berg, General Manager
Dairyland Power Cooperative
3200 East Avenue South
P.O. Box 817
La Crosse, WI 54602-0817

SUBJECT: NRC INSPECTION REPORT NO. 050-00409/11-02(DNMS) – LA CROSSE BOILING WATER REACTOR

Dear Mr. Berg:

On April 29, 2011, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the permanently shutdown La Crosse Boiling Water Reactor (LACBWR) facility. The purpose of the inspection was to assess the safety of spent fuel storage in the LACBWR spent fuel pool as followup to the Fukushima Daiichi Nuclear Station event in Japan. NRC Inspection Procedure 60801, "Spent Fuel Pool Safety at Permanently Shutdown Reactors," and guidance from Temporary Instruction (TI) 2515/183, "Followup to the Fukushima Daiichi Nuclear Station Fuel Damage Event," were used to conduct the inspection. The enclosed inspection report presents the inspection results which were discussed on April 29, 2011, with Mr. M. Brasel and other members of your staff.

The objective of this inspection was to promptly assess the capabilities of the LACBWR site to respond to extraordinary consequences similar to those that have recently occurred at the Japanese Fukushima Daiichi Nuclear Station. The results from this inspection, along with the results from other inspections performed at operating commercial nuclear plants in the United States will be used to evaluate the U.S. nuclear industry's readiness to safely respond to similar events. These results will be used by the NRC to determine if additional regulatory actions are warranted.

Areas examined during the inspection are identified in the enclosed report. Within these areas, the inspection consisted of an examination of procedures and representative records, walkdowns of systems, structures and components that support spent fuel pool safety and interviews of personnel.

All of the potential issues and observations identified by this inspection are contained in this report. The NRC will further evaluate any issues to determine if future regulatory actions are necessary. These actions, if any, will be documented by the NRC in separate correspondence. You are not required to respond to this letter.

In accordance with Title 10 of the Code of Federal Regulations (CFR) 2.390 of the NRC's "Rules of Practice," a copy of this letter and the enclosed report will be available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide

Documents Access and Management System (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html.

If you have any questions, please feel free to contact Mr. Lionel Rodriguez of my staff. You can reach Mr. Rodriguez at (630) 829-9609.

Sincerely,

/RA/

Christine A. Lipa, Chief
Materials Control, ISFSI, and
Decommissioning Branch
Division of Nuclear Materials Safety

Docket No. 050-00409
License No. DPR-45

Enclosure:
Inspection Report No. 050-00409/11-02(DNMS)

cc w/encl: M. Brasel, Plant Manager, La Crosse Boiling
Water Reactor
J. McRill, Technical Support Engineer
T. Zaremba, Wheeler, Van Sickle and Anderson
G. Kruck, Chairman, Town of Genoa
J. Kitsembel, Wisconsin Public Service
Service Commission
P. Schmidt, Manager, Radiation Protection Section
B. D. Burks, P.E., Director, Bureau of Field Operations
Spark Burmaster, Coulee Region Energy Coalition
State Liaison Officer
Chief, Radiation Protection Section, Division of Health,
WI Department of Health and Social Services

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WI Department of Health and Social Services

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U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Docket No:	050-00409
License No:	DPR-45
Report No:	050-00409/11-02(DNMS)
Licensee:	Dairyland Power Cooperative
Facility:	La Crosse Boiling Water Reactor
Location:	La Crosse Site Genoa, Wisconsin
Dates of Inspection:	On-site April 12-15, 2011
Inspectors:	Lionel Rodriguez, Reactor Inspector
Approved by:	Christine A. Lipa, Chief Materials Control, ISFSI, and Decommissioning Branch Division of Nuclear Materials Safety

Enclosure

EXECUTIVE SUMMARY

La Crosse Boiling Water Reactor (LACBWR)
NRC Inspection Report 050-00409/11-02(DNMS)

This inspection assessed the La Crosse Boiling Water Reactor (LACBWR) staff's ability to cope with design basis and beyond design events in response to the problems that occurred at the Japanese Fukushima Daiichi Nuclear Station in March 2011. The inspection focused on LACBWR's ability to respond to and implement mitigative strategies for station blackout conditions, seismic, tornado, flood, and fire events. These inspection results, along with the results from similar inspections at operating commercial nuclear plants in the United States, will be used to evaluate the U.S. nuclear industry's readiness to respond to similar events. The results will also be used by the NRC to determine if additional regulatory actions are warranted.

Overall, the inspector concluded that there would be minimal consequences to the health and safety of the licensee's onsite staff and members of the public following a design basis event involving the spent fuel pool (SFP) at LACBWR. This conclusion is based on the availability of several sources of SFP makeup water including those that do not require offsite power. Additionally, LACBWR staff has more than 7-days to implement compensatory actions before water level in the pool would drop to a level that potentially complicates recovery. Moreover, in the unlikely event that the SFP was completely drained of water, a potential fuel melt condition is not credible due to the composition of the cladding material and the extended length of time the spent nuclear fuel has decayed in the pool since its removal from the reactor vessel.

Report Details

1.0 Spent Fuel Pool Safey

a. Inspection Scope

The objective of this inspection was to perform a broad assessment of the licensee's capability and readiness to cope with design basis and beyond design basis events such as those that occurred at the Fukushima Daiichi Nuclear Station in Japan. The inspection assessed the licensee's capability to respond to and mitigate the consequences that result from station blackout conditions as well as design basis and beyond design basis seismic, tornado, flooding and fire events. In particular, the inspectors assessed the licensee's ability to implement mitigative actions upon loss of cooling and/or water inventory in the spent fuel pool (SFP). If necessary, a more specific follow-up inspection will be performed at a later date.

b. Observations and Findings

The following table documents the NRC inspection at the La Crosse Boiling Water Reactor facility performed in accordance with IP 60801 and guidance from TI 2515/183.

c. Conclusions

These inspection results, along with the results from similar inspections at operating commercial nuclear plants in the United States, will be used to evaluate the U.S. nuclear industry's readiness to respond to a similar event. The results will also be used by the NRC to determine if additional regulatory actions are warranted.

2.0 Spent Fuel Pool Safety Inspection Results

02.01 Design Basis Information

Review the facility Defueled Safety Analysis Report (DSAR) or equivalent reports to identify design basis seismic, flood/seiche, tornado and fire events. Identify systems, structures and components (SSCs) that are intended to support fuel safety and radiation safety function (i.e., contain radioactive materials) and are designated as important to the defueled condition. The SSCs important to the defueled condition should be capable of performing their specified function(s) associated with design basis events. Within these reports, identify wind loading design, water level (flood) design, missile protection, fire and seismic qualification to understand their bases and to recognize potential vulnerabilities associated with SSCs.

Describe the licensee's design basis seismic, flood/seiche, tornado and fire events. Specifically, identify wind loading design, water level (flood) design, missile protection, fire and seismic qualification.

Seismic:
The safe shutdown earthquake (SSE) peak ground acceleration postulated for the LACBWR site is 0.11g. As provided in the licensee's systematic evaluation program (SEP) assessment, the containment structure and the Spent Fuel Pool (SFP) (also known as Fuel Element Storage Well (FESW)) were determined to be capable of withstanding the postulated earthquake loadings. The storage racks inside the pool were also determined to be able to withstand the postulated loads of the SSE event.

Tornado and Wind:
As documented in the SEP assessment, analyses of the containment building structure determined that it could withstand both the tornado winds and tornado generated missiles associated with the 1 in 100,000 year tornado wind speed of 220 mph. Additionally, the LACBWR containment building exhaust ventilation stack and the nearby Genoa-3 (G-3) stack, a part of the licensee's coal fired plant, were evaluated for wind loadings of 160 mph associated with the 1 in 10,000 year tornado generated wind velocity. These exhaust stacks were shown not to damage the LACBWR containment building due to unlikely failure at this wind speed. In 2006, an opening to the containment building was made to support removal of the reactor vessel and a roll-up door was put in place to close the opening. The door panels are designed to withstand 25 pounds per square feet of wind loading, which is consistent with the original containment building structure. Since the SFP is on the opposite side of the containment building from the opening and at a low oblique angle, it cannot be impacted in a direct linear path by wind driven material entering through the opening. Furthermore, if material were to enter containment, the consequences are bounded by the analyzed accident scenarios for the SFP. Therefore, it was concluded that the equipment located inside the containment, including the SFP, is protected from postulated wind loading effects.

Flood:
The maximum probable flood (MPF) proposed (one-in-a-million-year return frequency flood) for the LACBWR site during the SEP safety assessment was a flood elevation of 658 feet mean sea level (MSL) coincident with 3-foot high wind generated waves from

the Mississippi River to 661 feet. The LACBWR site is positioned on a filled-in area on the east bank of the Mississippi River at an elevation of 639 feet. Potential flood impacted non-watertight openings in walls of structures begin at elevation 640.0 feet MSL. The 100 year flood for the site is postulated at 637.2 feet MSL and the 500 year flood at 640 feet MSL. The maximum historic flood (in 1965) was 638.2 feet MSL. The standard project flood is 643.2 feet MSL. The initial design criteria for LACBWR site required passive protection for a 100 year flood, which the site meets.

Site procedures require that certain actions be taken at various flood water stages. For example, at river elevation of 630 feet MSL, the licensee procedurally implements a heightened monitoring plan. A flood warning condition is declared at 635 feet MSL at which time flood control operations include construction of a temporary dike, if necessary. At 639 feet MSL an Unusual Event is declared. At 643 feet MSL a flood crisis level is declared and actions are taken to minimize the differential pressure on the containment building. The early warning notification to the site of flood cresting is 4-5 days. The inspector determined that the site has the necessary controls to ensure that the SFP is able to perform its safety function during various postulated flooding events at the site.

Fire:
The LACBWR site fire protection program incorporates guidance issued in NRC Regulatory Guide 1.191 for fire protection of decommissioning plants. The associated fire protection plan for the LACBWR site was developed to prevent fires, effectively respond to fires, and minimize the risk to the public from fire emergencies through an integrated system of administrative controls, equipment, personnel, tests, and inspections. The fire protection plan includes a description of fire areas, fire loadings, and extinguishing and detection capabilities. The LACBWR site can safely maintain and control the SFP in the case of the worst case postulated fire in each area of the plant. Although the postulated fires may impact support systems for the SFP, the loss of these systems fall within the analyzed accident scenarios postulated for the LACBWR site. No fire within the containment building would propagate to endanger the safe storage of the spent nuclear fuel.

All spent nuclear fuel assemblies are clad with stainless steel. No zirconium alloy cladding is used in fuel construction; therefore there is no risk of a zirconium metal fire and disassociation of hydrogen from water if the SFP were to lose its entire water inventory.

Identify systems, structures and components (SSCs) that are intended to support fuel safety and radiation safety function (i.e., contain radioactive materials) and are designated as important to the defueled condition, understand their bases and to recognize potential vulnerabilities associated with SSCs.

The LACBWR site has three SSCs that are considered Important to Safety (ITS); the SFP, the fuel handling system, and the reactor building crane. Additionally, certain SSCs that are classified as Not Important to Safety (NITS) are within the purview of the licensee's Maintenance Rule Program. These SSCs are the reactor building, radiation monitoring system, component cooling and demineralized water systems, overhead storage tank (OHST), Heating Ventilation and Air Conditioning (HVAC) system, and electrical distribution system.

The demineralized water system is one of two principal makeup sources relied on for the SFP. This system in turn relies on demineralized water from the Genoa-3 (G-3) coal plant which shares the site with LACBWR. The water is transferred to the LACBWR site in batches and then held in the virgin water tank until it is needed for makeup to the SFP or other plant systems.

The inspector noted that although the virgin water tank is usually maintained at a level to support sufficient makeup volume, administrative controls are not in place to ensure the necessary minimum water volume is maintained in the tank at all times. The inspector also observed that at least part of the line coming from the G-3 site was PVC piping and not seismically qualified. The virgin water tank is located on top of the office building structure adjacent to the turbine building. The tank structure was not analyzed during the SEP safety assessment nor does documentation exist that bounds the effects of a SSE on this structure.

The overhead storage tank is the second of the two makeup sources relied upon for makeup water to the SFP. Similar to the virgin water tank, administrative controls were not established to ensure the minimum volume of water is maintained in this tank. Although the containment building was demonstrated to survive the design basis earthquake, the adequacy of the OHST and its associated piping have not been fully assessed.

The licensee acknowledged the inspector's observations relating to the makeup sources. They indicated they plan to review LACBWR site requirements to determine whether any additional controls on required water volume need to be implemented for their makeup sources.

The electrical distribution system powers all systems at the LACBWR site, including the SFP cooling system. The inspector observed that during a flooding event, water could potentially impact areas where electrical equipment busses and the diesel generators are located. However, the inspector determined that sufficient administrative flood impact controls were in place to preclude or mitigate effects.

Discuss general results including corrective actions by licensee.

The SFP makeup sources and the site's electrical distribution system are not credited for design basis events. However, given the extended time available to implement compensatory measures and the variety of options to provide makeup water to the SFP, remedial actions are not warranted.

02.02 Siphon and Drain Protection

Review the configuration of the spent fuel pool (SFP), SFP piping and any interconnected piping systems to determine whether the configurations represent a siphon or drain path. If anti-siphon devices are credited by the licensee in their spent fuel pool operational occurrences and/or design basis events, verify that the devices exist and are functional.

Review maintenance and surveillance procedures to determine whether drain and anti-siphon systems are maintained and that temporary hoses are controlled to preclude unauthorized use.

The licensee should be knowledgeable of any potential siphon or drain paths and have procedures that can identify, resolve and minimize the probability of occurrence of an undetected drain or siphon. These considerations should have been documented by the licensee in their response to NRC Bulletin 94-01. Information Notice No. 93-83 also provides pertinent information.

Describe the licensee's spent fuel pool configuration that represent a siphon or drain path. If anti-siphon devices are credited by the licensee in their spent fuel pool operational occurrences and/or design basis events, document if the devices exist and are functional.

There are several penetrations in the SFP. The original design of the SFP included a penetration below the top of stored fuel. However, original design pathways have been modified and lines either removed or sealed with welded plugs. The lowest penetration of the SFP that represents a credible siphon or drain path is above the top of active fuel. If this line were postulated to break, a siphoning event could lower the water in the pool to within approximately 2-feet above the spent fuel.

The licensee has experimental data from a test in 1993 that demonstrates the water in the SFP would not boil after the postulated worst case SFP pipe break coincident with a loss of SFP cooling. The water temperature in the SFP is expected to stabilize at approximately 150 degrees Fahrenheit. The licensee would have more than 7-days to implement corrective actions to restore water level in the SFP due to losses from evaporation.

Describe the licensee's anti-siphon devices that are credited (and not credited) by the licensee in their spent fuel pool operational occurrences and/or design basis events, verify and document that the devices exist and are functional.

The licensee does not have any anti-siphon devices. More than one week is available to implement corrective actions during a siphoning or drain-down event before mitigative actions could be impacted by radiological conditions.

Describe the licensee's procedures that can identify, resolve and minimize the probability of occurrence of an undetected drain or siphon

The SFP level is continuously monitored in the control room and verified periodically by visual inspection. The control room level instruments generate audible alarms when SFP level decreases to a selected level which is above the minimum allowable level as specified in the technical specifications. The procedure response to a low water level alarm is to establish makeup flow to the SFP and investigate the source of leakage if level is rapidly decreasing. A visual inspection of the SFP is performed by an operator twice daily. The SFP level is also logged in the control room at specified intervals. SFP level monitoring equipment is subject to routine surveillance including regularly scheduled calibrations.

Area radiation monitors are also installed in the vicinity of the SFP. These monitors provide indication in the control room which would alert operators to an increase in radiation levels near the SFP. A continuing rise in radiation levels would provide additional indications that water level in the SFP was decreasing.

Discuss general results including corrective actions by licensee.

The inspector reviewed the licensee's SFP design and methods for monitoring SFP level. The inspector also reviewed the licensee's response to NRC Bulletin 94-01. The design of the SFP and the controls the licensee has in place adequately address postulated SFP drain events.

02.03 Loss of Spent Fuel Pool Cooling

Review the Defueled Safety Analysis Report (DSAR) or equivalent reports to identify the time available to initiate compensatory measures in the event that forced cooling to the SFP is lost. Also, identify the resultant radiological impact in areas of the plant that need to be occupied to implement compensatory actions for the loss of cooling event. Identify the SFP heat load used to calculate the times available before the volume of water in the pool reaches (1) saturation; (2) the time available for uncovering the assemblies due to boil-off; and (3) the required rate of makeup water necessary to match pool boil-off.

Describe the SFP heat load used to calculate the times available before the volume of water in the pool reaches saturation. Discuss the time available for uncovering the assemblies due to boil-off; and the required rate of makeup water necessary to match pool boil-off.

The licensee's experimental data from 1993 tests demonstrated that SFP water could not boil should all cooling systems fail. Extrapolation of the experimental data demonstrates that the licensee has several weeks to restore SFP cooling following a loss of cooling accident before the fuel becomes uncovered due to evaporation.

The required makeup rate of water to the SFP during a loss of SFP cooling is comparable to the amount of makeup required during normal plant operations. During a loss of SFP cooling, the only water inventory loss would be from evaporative losses and minimal

SFP known leakage. The average SFP leakage rate is 21 gallons per day. The evaporation loss rate depends on whether or not the SFP cover is in place. The highest water loss due to the combined effects of leakage and evaporation with the cover off over the last year was approximately 53 gallons per day, averaged over a month. The combined losses equate to a required makeup rate of less than 0.1 gallons per minute. Should no makeup water be added, pool water level would drop less than 1 foot over a two week time period. Consequently, the licensee has several weeks to implement mitigating actions before the fuel would be partially uncovered.

Describe the radiological impact in areas of the plant that need to be occupied to implement compensatory actions for the loss of cooling event.

As discussed above, a loss of cooling event would have a minimal impact on plant conditions. Water is not expected to boil and the makeup rate required is comparable to the amount of makeup required during normal plant conditions. The licensee has several weeks to restore SFP cooling after a loss of cooling event before the situation would potentially impact recovery operations. Therefore, it is not expected that there would be a radiological impact to plant personnel or members of the public due to a postulated loss of cooling event.

Discuss general results including corrective actions by licensee.

Water in the SFP is not expected to boil and several weeks are available to restore spent fuel cooling. Therefore, no corrective actions are necessary.

02.04 Loss of Spent Fuel Pool Inventory

Review the DSAR or equivalent reports to identify the time available to initiate compensatory measures in the event that the worst case postulated fuel pool inventory event occurs. This may include rupture of cooling and/or drain lines that could cause the pool to gravity drain to the lowest elevation postulated.

Identify the resultant radiological impact in areas of the plant that need to be occupied to implement compensatory actions for the rupture event. Identify the times available before the volume of water in the pool reaches saturation; the time to uncover the fuel assemblies due to the combined effects of drain-down and boil-off; and the required rate of makeup water necessary to match losses.

Additionally, identify the radiological impact of the worst case (beyond postulated) condition such as a catastrophic failure (crack or hole) in the SFP that lowers cooling water to the bottom of the active fuel.

Determine the predicted heat-up time to fuel melt, if applicable, should drain-down occur. If applicable, the inspector should review the licensee's action plan in response to a zirconium fire resulting from a drain-down event.

Describe the time available to initiate compensatory measures in the event that the worst case postulated fuel pool inventory event occurs.
The worst case postulated pipe break would not drain down the SFP to a level below the top of active fuel. The penetration into the SFP is about 22 inches above the top of active fuel. Therefore, the lowest the water could drain down during a credible event is about 22 inches above fuel. All other penetrations into the pool (except for the bottom inlet line) are above this penetration. The bottom of the transfer canal is also above this penetration. A rupture of the inlet line at the bottom of the SFP is not considered a credible accident because the line is seismically qualified. The inlet line terminates at the biological shield wall where it is sealed with a welded plug. The line is protected from a wind driven missile that might enter the containment structure by the remaining portion of the biological shield wall. The licensee has experimental data from a test in 1993 that demonstrates the water in the SFP would not boil should cooling be lost. Following a pipe break event, there would be a smaller water volume to act as the heat sink, therefore the initial heat up rate of the SFP water would be approximately twice as great as that during the 1993 test. The heat removal rate from the SFP would also be slightly reduced since the wetted area would be approximately 42% less. However, the heat removal rate would increase rapidly as the temperature in the SFP increases due to the differential temperature between the water and its environment. Therefore, the temperature of the water is expected to stabilize slightly above 150°F, but below the boiling point of water. The required makeup rate of water to the SFP during the postulated pipe break event would be comparable to the amount required during normal plant conditions. As described in section 02.02 above, the highest water loss due to the combined effects of leakage and evaporation is about 53 gallons per day, averaged over a month. This equates to a required makeup rate of less than 0.1 gallons per minute (gpm). This data indicates that the licensee has more than a week to implement corrective actions to restore water level in the SFP before the fuel is partially uncovered following a combined loss of cooling and postulated pipe break event.
Discuss the resultant radiological impact in areas of the plant that need to be occupied to implement compensatory actions for the rupture event. Identify the times available before the volume of water in the pool reaches saturation; the time to uncover the fuel assemblies due to the combined effects of drain-down and boil-off; and the required rate of makeup water necessary to match losses.
Radiation dose rates are not expected to significantly increase after the postulated pipe break event that would preclude entry into area to affect repairs or execute compensatory measures.

The licensee has a calculation that estimates the radiological conditions should the SFP be drained of all water. The assumptions used in the calculation were derived consistent with NUREG/CR-0649, "Spent Fuel Heat Up Following the Loss of Water During Storage". The NUREG/CR document reviews coping strategies for a completely drained spent fuel pool. Using the data from the NUREG/CR document, and applying it to the LACBWR site, the NRC inspector concluded that radiological conditions near the SFP following a loss of all pool water would not preclude access into the area.
Discuss the predicted heat-up time to fuel melt, if applicable, should drain-down occur. If applicable, discuss the licensee's action plan in response to a zirconium fire resulting from a drain-down event.
Fuel in the SFP is predicted not to melt nor become flammable following a complete loss of water inventory given the composition of the cladding material and small decay heat load. The fuel assemblies at the LACBWR site are clad with stainless steel, eliminating the possibility of a zirconium metal fire and disassociation of hydrogen from water. The LACBWR fuel assemblies have been stored in the SFP for over 20 years and consequently the decay heat loads have significantly diminished.
Discuss general results including corrective actions by licensee.
Should a credible loss of SFP inventory occur the licensee has more than one week to initiate compensatory measures. The resultant heat loads in the SFP are low enough to preclude fuel melting. Additionally, the dose rates near the SFP would be low enough to permit access to the SFP to initiate compensatory measures.

02.05 Station Black Out (SBO) Mitigating Strategies

Review the DSAR or equivalent reports to identify the primary alternating current (AC) and backup AC and/or Direct Current (DC) power supplies.

Walkdown the primary and backup power supplies to identify potentially adverse conditions, material condition problems and/or system line-ups that could be outside system design or detrimental to long-term system operability.

Identify backup power supplies intended to ensure SFP cooling, makeup water, instrumentation, alarms, and leakage detection are maintained upon SBO conditions.

Verify through walkdowns that backup power supplies are available and functional. Review surveillance protocols and test results which demonstrate functionality of the backup power supplies.

Determine that materials necessary to support backup power supplies are adequate, including fuel oil supply in day tanks and other onsite storage tanks. Determine whether these materials are adequate, properly staged and maintained in a state of readiness. If battery powered supplies are intended for use, determine if the battery system is rated for a capacity equivalent to that credited by the licensee in the DSAR or as provided in station auxiliary or emergency operating procedures (AOPs/EOPs), as applicable.

Verify through walkdowns that procedures (AOPs/EOPs) for response to SBO conditions are developed and executable including the availability of necessary support equipment and supplies.

Review training and qualification information to determine whether personnel are sufficiently knowledgeable to execute the procedures.

Describe the primary alternating current (AC) and backup AC and/or DC power supplies, and identify backup power supplies intended to ensure SFP cooling, makeup water, instrumentation, alarms, and leakage detection are maintained upon SBO conditions.

Primary AC power is supplied to the site from a single offsite power supply. This supply feeds two busses, which in turn supply two essential busses. The two essential busses are each backed up by separate emergency diesel generators (EDGs) which start automatically upon a loss of offsite power. Each EDG can supply all essential and most non-essential plant loads. The busses have the capability to be cross-tied; therefore one EDG can supply each essential bus.

The electrical distribution system has station batteries which provide backup DC power during a station blackout for at least 8 hours.

Independent of the plant's electrical distribution system, the LACBWR site has diesel driven pumps that can be used to pressurize the fire protection header with river water during a loss of off-site power. Each diesel driven pump is equipped with a battery starting system and diesel fuel oil day tank.
Describe results from the walkdown of the primary and backup power supplies to identify potentially adverse conditions, material condition problems and/or system line-ups that could be outside system design or detrimental to long-term system operability. Describe if materials necessary to support backup power supplies are adequate, including fuel oil supply in day tanks and other onsite storage tanks. Describe whether these materials are adequate, properly staged and maintained in a state of readiness.
The inspector toured areas containing electrical switchgear and the EDGs. The LACBWR electrical distribution system (including the EDGs) is not credited for coping with a design basis accident. The system is not expected to survive a design basis, or beyond design basis event. However, a station blackout event is analyzed in the licensee's decommissioning plan. If a hypothetical complete station blackout were to occur, the site would lose SFP cooling. The loss of spent fuel cooling is an analyzed condition for which the site has several weeks to initiate compensatory actions. The inspector noted during a walkdown an unsupported ladder near an EDG that could impact one of the EDG support systems. Similarly an unsupported ladder was found behind a control room panel which could impact nearby electrical equipment if not properly controlled. The licensee acknowledged the inspector's observation and indicated they plan to review LACBWR site practices to control housekeeping.
Discuss procedures (AOPs/EOPs) for response to SBO conditions that are developed and executable including the availability of necessary support equipment and supplies.
The LACBWR site has adequate procedures for using the EDGs and diesel driven pumps during a station black out (SBO). All the diesels have associated surveillance requirements to promote their availability to mitigate a SBO.
Discuss general results including corrective actions by licensee.
The LACBWR electrical distribution system (including the EDGs) is not credited for coping with a design basis accident. The system is not expected to survive a design basis, or beyond design basis event. However, the site maintains diesel driven pumps that can be used to pressurize the fire protection header with river water during a loss of off-site power. If a hypothetical complete station blackout were to occur, the site would lose SFP cooling. The loss of spent fuel cooling is an analyzed condition for which the site has several weeks to initiate compensatory actions.

02.06 Makeup Water and Mitigating Strategies

Identify all the SFP makeup water supplies as provided in the DSAR or other equivalent reports. Also, identify any other makeup sources that the licensee may use if conditions warrant.

Walkdown selected pumps, valves and piping associated with makeup water supplies. Review SFP system configurations to determine if they correspond with the Piping and Instrumentation Diagrams (P& IDs) and licensing basis documents.

For makeup water supplies, ensure that appropriate capacities exist and that the makeup rate is sufficient to overcome loss rate. Verify through walkdowns that equipment for delivery of makeup water is available and functional. Review equipment surveillance and test records, as applicable. If hoses, portable pumps, and other temporary equipment is intended for use, verify that equipment is staged and in a state of readiness.

Verify procedures are developed to ensure makeup water is provided in a timely manner to mitigate consequences. Also, determine if makeup water can be provided uninterrupted for a duration consistent with anticipated recovery needs. Determine what makeup sources and strategies are developed (or planned) to ensure makeup supplies are available for prolonged periods in the event of a beyond design basis event.

Verify training and qualifications of operators and support staff needed to implement procedures are adequate. Determine if a sufficient number of qualified staff is available for procedure implementation.

Discuss all the SFP makeup water supplies as provided in the DSAR or other equivalent report and identify any other makeup sources that the licensee may use if conditions warrant. In addition, discuss capacities for makeup rate vs. loss rate.

The LACBWR site has two routinely used makeup sources to the SFP, the Overhead Storage Tank (OHST) system and the demineralized water system. Additional sources available include a pathway through the High Pressure Service Water (HPSW) system which uses water from the Mississippi River. Water from the fire protection header could also be directed into the SFP via a fire protection hose located near the pool. Although not available on site, a portable pump could be used to pressurize the fire protection header and direct water into the SFP during an emergency.

The licensee has two alternate pathways to makeup water to the SFP from the OHST. Both pathways gravity drain water from the OHST to makeup to the SFP. The fill lines require valve manipulations operated either remotely from the control room or locally inside the containment building to makeup to the SFP. The control room operated valve is powered from station batteries during a SBO. Flow rates for the two pathways from this makeup source exceed the makeup rate necessary to compensate for postulated

event driven inventory losses. The tank's water inventory is not strictly controlled by site procedures. The NRC inspector observed that the water level in the OHST was about 8,000 gallons of water at the time of the inspection.

The second routinely used makeup source to the SFP is from the demineralized water system. There is a normal method of makeup to the SFP, and there is also an emergency pathway that could be used to spray water into the SFP from the demineralized water system. The two pathways rely on the demineralized water transfer pumps to pressurize the system. The fill lines require valve manipulations operated either remotely from the control room or locally inside the containment building. The control room operated valve is powered from station batteries during a SBO. Flow rates for the two pathways from this makeup source exceed the makeup rate necessary to compensate for postulated event driven inventory losses. As with the OHST, the water inventory in the virgin water tank (the demineralized water system source) is not strictly controlled by site procedures. The NRC inspector observed that the water level in the tank was about 21,000 gallons of water at the time of the inspection

An additional makeup source is through the use of the HPSW system, but its use is not governed by procedure. The HPSW system uses diesel driven pumps which would be available during a SBO to pressurize the fire protection header using the Mississippi River water as the source. There is a cross connect from the HPSW system to the demineralized water system which could be used. This would supply makeup water from the river, to the HPSW system, and then through the demineralized water system to the SFP. Alternatively, since the HPSW diesel driven pumps pressurize the fire protection header, a fire protection hose near the SFP could be used to provide makeup water to the SFP from the river.

Although not available on site, another makeup possibility that is not governed by procedures could be through the use of a portable pump. The pump could use river or off-site water to pressurize the fire protection header. The fire protection hose near the SFP could then be used to provide makeup water to the SFP.

The capacity of any of the makeup sources discussed above would be sufficient for coping with the accidents postulated in the LACBWR decommissioning plan.

Discuss the results of the walkdown of selected pumps, valves and piping associated with makeup water supplies. Describe the availability and condition of hoses, portable pumps and other temporary equipment intended for use specifically if the equipment is staged and in a state of readiness.

The NRC inspector walked down portions of all the makeup sources described above. The inspector observed that failure to control fuel handling equipment and other material located between normal makeup lines to the SFP and a nearby wall could have a negative impact on the makeup lines that provide water into the SFP during a seismic event. The licensee acknowledged the inspector's observation and indicated they plan to review LACBWR site practices to control housekeeping.

The NRC inspector reviewed the licensee's procedures for coping with a loss of water inventory event. The procedures are adequate for coping with the design basis accident scenarios described in the LACBWR decommissioning plan. During the worst design basis accident the licensee has more than a week to establish a makeup source to the SFP before the fuel could be partially uncovered. Emergency procedures which direct the licensee to establish makeup flow to the SFP by using normal means of makeup were reviewed by the inspector and determined to be adequate.
Discuss general results including corrective actions by licensee.
No corrective actions are required to address design basis events. The licensee is considering alternate options for makeup water beyond those controlled by current procedures.
02.07 Flood and Fire Protection Mitigating Strategies Identify internal and external flooding events (including a seiche if applicable) and fire events as provided in the station DSAR. Identify SFP equipment and system vulnerabilities from these postulated events. Walkdown potential flood impacted areas to determine if required barriers, curbing, walls, and door penetration seals are in-place and intact. Assess the thoroughness of the licensee's walkdowns and inspections of equipment needed to mitigate fire and flood events to identify equipment vulnerabilities. Determine that procedures or plans have been developed to address those vulnerabilities. Verify that applicable agreements are in place to mitigate the consequences of a fire such as agreements with offsite fire departments and other emergency responders.
Describe any SFP equipment and system vulnerabilities from natural phenomenon.
There are two sources of normal makeup water to the SFP. These SFP makeup sources are not credited for coping with a design basis accident. The makeup sources are not required; however, the inspector noted that neither source has a specified minimum volume of water to be available for makeup to the SFP. Should an event render the SFP makeup system unavailable, the site has in excess of 7-days to initiate compensatory actions. The licensee acknowledged the inspector's observation and indicated they plan to review LACBWR site requirements for the makeup sources.
Describe the results of walkdowns of potential flood impacted areas.

The EDGs and some electrical busses are located at grade elevation. Therefore, water may impact the electrical distribution equipment during a flooding event. However, the site's electrical distribution system is not credited for coping with a design basis accident. This system is not expected to survive a design basis, or beyond design basis natural phenomena event. Should such an event occur, the site has more than 7-days to initiate compensatory actions. These actions include means for water makeup to the SFP upon loss of power.
Discuss agreements in place to mitigate the consequences of a fire such as agreements with offsite fire departments and other emergency responders.
The licensee's Fire Protection Plan includes an agreement with the Genoa Fire Department. In the event of an emergency at the LACBWR site, the fire department would provide assistance to the facility. The fire department is capable of providing rescue and fire-fighting support.
Discuss general results including corrective actions by licensee.
The LACBWR electrical distribution system and normal makeup water sources to the SFP are not credited for coping with a design basis accident. The systems are not expected to survive a design basis, or beyond design basis flooding event. However, should such an event render the electrical distribution and SFP makeup systems unavailable, the site has in excess of 7-days to initiate compensatory actions.
02.08 Mitigating Strategy Development Review newly developed or planned mitigating strategies for identified vulnerabilities. For example, the licensee should have performed walkdowns and inspections of equipment important to the defueled condition such as water storage tanks, fuel oil tanks, auxiliary transformers, DC power supplies, plant water intake structures, and fire/flood response equipment and developed mitigating strategies to cope with the loss of that important equipment.
Discuss newly developed or planned mitigating strategies for identified vulnerabilities.
The licensee is planning to generate a LACBWR internal memo to evaluate the incidents in Japan and determine how these apply to the LACBWR site. No other actions have been taken by the site.
Discuss general results including corrective actions by licensee.
An evaluation is planned by the licensee as specified above.
02.09 Environmental/Radiological Conditions and Special Tools

Evaluate radiological conditions that operators may encounter while traveling to the area where manual actions will be performed and within the areas those actions will take place. Conditions to be verified include:

- Capability to assess radiological conditions including provisions for planned special exposures
- Availability and functionality of respiratory protection equipment (including self-contained breathing apparatus)
- Availability and functionality of fixed and portable emergency lighting along access routes and manual operating stations
- Availability and functionality of communications equipment
- Availability and functionality of fire protection equipment
- Availability of special tools necessary to implement mitigating actions

Discuss general results including corrective actions by licensee.

The LACBWR site has EDGs that can supply backup power to essential and non-essential busses during a loss of offsite power. Station batteries are also available during a SBO. The station batteries would provide emergency power to essential plant control circuitry, communications equipment, and radiological monitoring equipment during a SBO.

The licensee would be able to remotely assess radiological conditions near the SFP during a SBO. The licensee has particulate filtering respirators which could be used during accident conditions should airborne radioactivity conditions exist. Most plant personnel are qualified to use these respirators including staff that would execute mitigating actions. Emergency lighting is available to implement the actions required by emergency procedures. The NRC inspector verified that the credited fire protection equipment was staged near the SFP and in an operational readiness condition. The inspector observed that all the necessary hoses, connections, and tools were in designated locations and readily available.

02.10 Staffing and Training

Review license shift staffing to determine whether enough qualified personnel are available to perform the required compensatory actions for prolonged periods.

Determine if response staff is knowledgeable and trained on compensatory actions and associated procedures.

Discuss general results including corrective actions by licensee.

The required compensatory actions following a postulated accident are minimal. As discussed in other sections of this inspection report, the licensee has more than 7-days to implement mitigating actions after a design basis SFP accident.

The licensee currently has sufficient trained and certified operators available to perform the actions required by the emergency operating procedures to mitigate the consequences of an accident. Many of the actions involve manipulation of controls in the control room. The actions that require manual and local operations could be implemented by a single individual in a short amount of time.

The NRC inspector verified, by review of training records, the qualifications of some of the operations staff. Records demonstrated that operations staff was adequately trained and knowledgeable of the LACBWR site systems.

02.11 Problem Identification and Resolution

Review corrective actions documents that relate to SFP cooling system functionality, SFP liner leaks and other problems that impact SFP safety. Determine if design changes were made that could impact safety or that are inconsistent with the DSAR. Review any open corrective action documents to identify vulnerabilities that may be outstanding. For a sample of selected issues, determine if corrective actions were appropriate.

Discuss general results including corrective actions by licensee.

The NRC inspector performed a review of maintenance records for different systems relating to the SFP. The records demonstrated adequate preventative maintenance for SFP support systems. Records also demonstrated adequate actions taken by the licensee when equipment was found to be degraded.

The NRC inspector also reviewed three changes made to the SFP and its support systems. The three changes were controlled through LACBWR site processes and were an improvement on the margin to safety from the original SFP design.

The NRC inspector did not identify any changes made to the facility that were inconsistent with the LACBWR decommissioning plan.

2.0 Exit Meeting

The inspectors presented the inspection results to Mr. M. Brasel and other members of your staff at the conclusion of the inspection on April 29, 2011. The inspectors asked the licensee whether any materials examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

M. Brasel, Plant Manager
J. McRill, Technical Support Engineer

ITEMS OPENED, CLOSED, AND DISCUSSED

Opened	None
Closed	None
Discussed	None

LIST OF DOCUMENTS REVIEWED

The following is a list of documents reviewed during the inspection. Inclusion on this list does not imply that the NRC inspectors reviewed the documents in their entirety but rather that selected sections of portions of the documents were evaluated as part of the overall inspection effort. Inclusion of a document on this list does not imply NRC acceptance of the document or any part of it, unless this is stated in the body of the inspection report.

- NUREG-0827; Integrated Plant Safety Assessment Systematic Evaluation Program La Crosse Boiling Water Reactor, June 1983
- NUREG-0827 Supplement No. 1; Integrated Plant Safety Assessment Systematic Evaluation Program La Crosse Boiling Water Reactor, August 1986
- LACBWR Operating Manual, Volume IV; Instrumentation, Control, and Electrical Distribution
- LACBWR Operating Manual, Volume I; Integrated Plant Operations
- LACBWR Operating Manual, Volume V; Service System
- LACBWR Operating Manual, Volume II; Reactor Process Systems
- LACBWR Fire Protection Procedure; Fire Protection Plan and Organization, February 2011
- SER; Safety Evaluation by the Office of Nuclear Reactor Regulation Relating to NUREG-0827 Sections 4.6, 4.9, and 4.13 Integrated Consequence Study LACBWR, September 9, 1986
- SER; Safety Evaluation by the Office of Nuclear Reactor Regulation Relating SEP Topic No. III-2, Wind/Tornado Events IPSAR Section No. 4.6 LACBWR, April 6, 1987
- LACBWR Administrative Control Procedure; Classification of Structures, Systems, and Components, Revision 18
- LACBWR Decommissioning Plan, Revision dated November 2010
- Letter to NRC; Dairyland Power Cooperative LACBWR Possession-Only License No. DPR-45 Response to NRC Bulleting 94-01, May 11,1994
- Letter to NRC Information Notice File; NRC Information Notice 93-83: Potential Loss of Spent Fuel Pool Cooling Following a Loss of Coolant Accident (LOCA), May 3, 1994
- LACBWR document; Estimate of Dose Rate on FESW Level from Dry FESW

- DPC Summary Report; Description of Work Task to Reduce Fuel Element Storage Well Leakage at LACBWR, February 10, 1981
- LACBWR Facility Change No. 58-99-19; Reroute of FESW Return Flow, September 22, 1999
- LACBWR Facility Change No. 58-88-12; Installation of a Second FESW Makeup Supply, July 20, 1988
- Calculation No. 0842501.01-S-004; Structural Integrity of Analysis of Spent Fuel Storage Well and Racks Inside the Reactor Building, Revision 0
- SER; Safety Evaluation by the Office of Nuclear Reactor Regulation Supporting Facility Modifications to Increase the Capacity of the Spent Fuel Storage Pool, February 4, 1980
- LACBWR Technical Report LAC-TR-137; Determination of FESW Heat-Up Rate Without Cooling (LACBWR Test Procedure OP-58-04), March 22,1994
- LACBWR License No. DPR-45, Dairyland Power Cooperative Docket No. 50-409 La Crosse Boiling Water Reactor Possession Only License, Amendment No. 71
- LACBWR Technical Specifications License No. DPR-45, Dairyland Power Cooperative Docket No. 50-409 La Crosse Boiling Water Reactor Possession Only License, Amendment No. 71

LIST OF ACRONYMS USED

AC	Alternating Current
ADAMS	Agencywide Documents Access and Management System
AOP	Abnormal Operating Procedure
CFR	Code of Federal Regulations
DC	Direct Current
DNMS	Division of Nuclear Materials Safety
DPC	Dairyland Power Cooperative
DSAR	Decommissioning Safety Analysis Report
EDG	Emergency Diesel Generator
EOP	Emergency Operating Procedure
FESW	Fuel Element Storage Well
GPM	Gallons Per Minute
G-3	Genoa Unit 3
HPSW	High Pressure Service Water
IPSAR	Integrated Plant Safety Analysis Report
LACBWR	La Crosse Boiling Water Reactor
NRC	United States Nuclear Regulatory Commission
MSL	Mean Sea Level
OHST	Overhead Storage Tank
P&ID	Piping and Instrumentation Diagram
SBO	Station Blackout
SEP	Systematic Evaluation Program
SER	Safety Evaluation Report
SFP	Spent Fuel Pool
SSCs	Structures, Systems, and Components
SSE	Safe Shutdown Earthquake
TI	Temporary Instruction