

March 11, 2010

Mr. William L. Berg
President and Chief Executive Officer
Dairyland Power Cooperative
3200 East Avenue South
P.O. Box 817
La Crosse, WI 54602-0817

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION ON LICENSE AMENDMENT
REQUEST FOR LA CROSSE BOILING WATER REACTOR, POSSESSION
ONLY LICENSE NO. DPR-45, IN SUPPORT OF DRY CASK STORAGE
PROJECT (TAC NO. J00359) (LAC-14071)

Dear Mr. Berg:

I am responding to your letter dated July 28, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML092470459), as supplemented by letters dated August 7, 2009 (ADAMS Accession Nos. ML092310242 and ML092260299), which forwarded the license amendment request for La Crosse Boiling Water Reactor (LACBWR), Possession Only License No. DPR-45. Your request proposes changes to Technical Specifications (TS), in support of the dry cask storage project at LACBWR. Specifically, you are requesting changes to the definition of "fuel handling," TS 2.2.3 (drainage of Fuel Element Storage Well (FESW)), TS 4.1.2 (limiting condition for operation of FESW), and TS 5.1.2.1 – TS 5.1.2.2 (surveillance requirements for FESW).

The U.S. Nuclear Regulatory Commission (NRC) staff accepted your license amendment request for review on September 10, 2009, and has determined that additional information is required to complete the review. The specific information requested is addressed in the enclosure to this letter. During a discussion with Mr. Michael Brasel of your staff, it was agreed that you would provide a response 45 days from the date of this letter.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice for Domestic Licensing Proceedings and Issuance of Orders," a copy of this letter will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records component of NRC's ADAMS. ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html>.

W.Berg

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If you have any questions, please contact me at (301) 415-5114 or Kristina.Banovac@nrc.gov.

Sincerely,

/RA/

Kristina L. Banovac, Project Manager
Reactor Decommissioning Branch
Decommissioning and Uranium Recovery
Licensing Directorate
Division of Waste Management
and Environmental Protection
Office of Federal and State Materials
and Environmental Management Programs

Enclosure:
Request for Additional Information

Docket No.: 50-409
License No.: DPR-45

cc: La Crosse Boiling Water Reactor Service List

W.Berg

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If you have any questions, please contact me at (301) 415-5114 or Kristina.Banovac@nrc.gov.

Sincerely,

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REQUEST FOR ADDITIONAL INFORMATION

LA CROSSE BOILING WATER REACTOR

LICENSE AMENDMENT REQUEST IN SUPPORT OF DRY CASK STORAGE PROJECT

DOCKET NO. 50-409

By letter dated July 28, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML092470459), as supplemented by letters dated August 7, 2009 (ADAMS Accession Nos. ML092310242 and ML092260299), Dairyland Power Cooperative (DPC, the licensee) submitted a license amendment request for License No. DPR-45, for La Crosse Boiling Water Reactor (LACBWR). The request proposes changes to Technical Specifications (TS), in support of the dry cask storage project at LACBWR. Specifically, changes are requested to the definition of "fuel handling," TS 2.2.3 (drainage of Fuel Element Storage Well (FESW)), TS 4.1.2 (limiting condition for operation of FESW), and TS 5.1.2.1 – TS 5.1.2.2 (surveillance requirements for FESW). In reviewing DPC's submittal, the U.S. Nuclear Regulatory Commission (NRC) staff has determined that the following information is needed to complete its review.

Request for Additional Information (RAI) 1:

The license amendment request (LAR) describes the licensee's plans for loading spent fuel into casks for on-site dry cask storage. The licensee is planning to use the general license provisions in 10 CFR Part 72, Subpart K, for storage of spent fuel at its site. A cask pool will be constructed in the area that previously housed the reactor pressure vessel, and the existing fuel transfer canal will be used to move the fuel from the FESW to the cask pool where it will be placed in an NRC-certified (under Part 72) spent fuel storage canister. During fuel loading operations, the fuel transfer canal and cask pool will be hydraulically contiguous with the FESW, and can be considered as an extension of the FESW.

The LAR does not specifically address the design of the cask pool. NRC staff understands that the licensee is currently evaluating whether the design and construction of the cask pool requires prior NRC approval, per 10 CFR 50.59.

The current TS (for the 10 CFR Part 50 license, DPR-45) contain requirements for the design and conditions of the FESW and for fuel storage and handling. The LAR does not address how these TS requirements apply to the "extended FESW," including the cask pool.

The LAR discusses the "jurisdiction of 10 CFR [Part] 72 over [dry cask storage system] DCSS loading operations," in relation to proposed changes to the definition of "fuel handling." It appears that the licensee is attempting to make a distinction between handling of individual fuel assemblies and handling of a NRC-certified canister/cask that contains fuel assemblies, in this proposed change. However, the general license provisions in Part 72, Subpart K, for the storage of spent fuel at power reactor sites, do not address safety aspects of fuel handling or spent fuel pool conditions during cask loading operations. Rather, the conditions of the FESW and fuel handling and storage activities (which would include activities within the "extended FESW") are governed by Part 50. The requirements in the Part 50 license and TS continue to

Enclosure

generally apply to the conditions of the FESW and to fuel storage and handling, during cask loading operations.

Please explain how the Part 50 TS, related to design and conditions of the FESW and fuel storage and handling, will apply to the “extended FESW,” or propose appropriate TS controls to address the “extended FESW,” taking into consideration the conditions of the Certificate of Compliance for the cask that will be used at LACBWR.

RAI 2

The amendment request proposes changes to TS requirement 4.1.2 for the minimum depth of water in the FESW, from 16 feet above irradiated fuel in the fuel storage racks, to: (1) 10 feet [referring to the depth of water above fuel in the *lower* tier storage rack when the FESW is drained to its lowest level (approximately 680 foot elevation), to allow for cask movement and preparation]; and (2) no less than two feet, nine inches (referring to the depth of water above fuel in *upper* tier storage rack when the FESW is drained to its lowest level at approximately 680 foot elevation).

LACBWR TS 4.1.1.2 requires a depth of at least two feet of water above a fuel assembly during fuel handling, and the LAR states that the water level will be maintained at the approximately 695 foot elevation while fuel is being moved through the fuel transfer canal to the cask pool, to meet this TS requirement. It is not clear from the license amendment request how the water level will fluctuate in the cask pool during the loading operations.

Please provide additional details regarding the cask loading operations overview, specifically addressing changes in cask pool water levels as water is added and drained from the FESW and cask pool. Please specifically address water levels in the cask pool at the time the canister lid is installed.

RAI 3

TS 2.2.3 requires that the FESW shall be designed and maintained to prevent inadvertent draining of the FESW below an elevation of 679 feet.

The LAR proposes to drain the connected cask pool area and FESW in order to remove the cask pool gate to remove filled casks from and place empty casks into the cask pool. The amendment request does not identify the point of drainage from the cask pool.

- a. Please describe the method by which the cask pool will be drained and the point from which this drainage will be taken.
- b. Please identify any physical aspects of the drainage flowpath that would limit accidental drainage from the cask pool and the FESW.

RAI 4

Surveillance requirements in TS 5.1.2.1 currently require the licensee to monitor the FESW water level and water temperature once per 24 hours. The amendment request proposes a change to this TS to require a more frequent surveillance and verification of FESW water level when FESW water level is lower than 10 feet above irradiated fuel, to allow more time to take corrective actions if the FESW cooling system is affected. Specifically, the licensee is proposing to increase the frequency of verification of the water *level* to once per 6 hours. The proposed TS change does not include an increase in frequency of verification of the water *temperature*.

- a. Please explain why an increased frequency of verification of the water temperature, during lower water level conditions (when FESW water level is lower than 10 feet above the fuel), is not necessary.
- b. Please explain whether the water level and temperature are monitored continuously and whether there are alarm set points regarding water levels and temperatures.
- c. Please explain the effects of any vortexing or air entrapment for the FESW pump suction piping located at the 679 foot elevation of the FESW, if the water were to inadvertently drain to this level.

RAI 5

The LAR states that the geometry and poison (boron) loading of the fuel storage rack cells ensures the FESW is maintained subcritical and k_{eff} (effective multiplication factor) in the FESW does not exceed 0.95 at any time. LACBWR Operations Procedure OP-58-02, "Irradiated Fuel Element Storage Rack Poison Material Surveillance Program," is used at LACBWR to monitor the long term performance of and verify the integrity of the neutron absorber material in the spent fuel storage racks, which is required to control the reactivity of the fuel storage system. The licensee tests the loss of boron in the neutron absorbers by measuring the weight of the surveillance coupons.

Since the boron loading is credited to maintain the subcriticality of the pool, the staff has questions regarding the material condition of the neutron absorbing material in the storage racks. In order to have reasonable assurance that the neutron absorbing material will be able to perform its intended function during movement of fuel assemblies and work in the FESW during cask loading operations, the staff requests the following information.

- a. In OP-58-02, a weight loss of 10 percent or less for any sample (of the composite poison material) is acceptable, and no further examinations of these or other samples are required. Please clarify the rationale for the upper limit of a 10 percent weight loss. Also, please state what boron-10 areal density a 10 percent weight loss correlates to and discuss why it is justified.
- b. Please discuss whether neutron attenuation testing has been performed on the coupons/racks. If so, please discuss the dates of the tests performed and the results.

- c. OP-58-02 indicates that some of the coupons were sent to Northeast Technology Corp (NETCO) for testing in 1997. Please discuss why the coupons were sent to NETCO for testing, what testing was performed, and the results of the testing.
- d. OP-58-02 states that visual testing is also performed on the coupons. Please provide and discuss the results of these tests.
- e. Please provide and discuss trending data of the coupons.
- f. Please discuss what calculations are performed to determine that $k_{\text{eff}} \leq 0.95$ is maintained, based on the results of the surveillance in OP-58-02.

RAI 6

The licensee used a special test procedure STP-58-01, "Perform Radiation Survey of FESW at Canal Gate Level," to obtain underwater radiation measurements needed to calculate the dose rate at the 701 foot (701') elevation in the reactor building. This information is needed to assess potential occupational doses for the proposed operations.

STP-58-01 does not provide any information (e.g., make or model number) on the radiation survey instrumentation used. STP-58-01 refers to another procedure, HSP-02.6 "Radiation Surveys," which may contain this information, but this procedure was not provided for NRC staff review.

Please provide the technical specifications provided by the radiation instrumentation manufacturer or provide a description of the design and capability of the proposed radiation instrumentation used with STP-58-01.

RAI 7

The licensee provided a July 1, 2009, memorandum, which described a calculation of the dose rate at the 701' elevation using the 680' 5" elevation radiation survey measurement. The exposure rate measured at the 680' 5" elevation was 1030 milliroentgen/hour (mR/hr) or an assumed dose rate of 1030 millirem/hour (mrem/hr). The licensee used this measured dose rate to calculate a dose rate at the 701' elevation of 25.3 mrem/hr.

The equation that the licensee used in the calculation of the 701' elevation dose rate appears to be incorrect. The equation contains an additional $1/r^2$ term in the denominator, and this term does not appear to be necessary since the " $\ln(r^2 + d^2) / d^2$ " term accounts for the geometrical attenuation of the dose rate. Also, the dose rate equation for a disk source should contain an additional multiplicative term of pi (π) in the numerator.

NRC staff used the equation for a disk source dose rate, $I = \pi I_0 \ln[(r^2 + d^2) / d^2]$ from Herman Cember & Thomas Johnson, 4th Edition, *Introduction to Health Physics*. This equation for the disk source dose rate is also used in *Principles of Radiation Shielding* by Arthur Chilton et al. Using this equation and the licensee's radiation measurement of 1030 mrem/hr, the NRC staff calculated a dose rate for the 701' elevation of 225 mrem/hr.

NRC staff also used the Microshield computer code to determine the dose rate and used a simple model of a 3-meter diameter x 3-meter height cylindrical radiation source. NRC staff used cesium-137 and cobalt-60 (separately) as the radioactive material in the source, and the source concentration was adjusted to provide a dose rate of 1030 mrem/hr at the 680' 5" elevation. Then, the dose rate was calculated at the 701' elevation using Microshield. The dose rates calculated were in the 200 – 300 mrem/hr range. The staff's results for the Microshield calculations and the calculation using the disk source equation appear to be consistent.

Please provide an explanation for the apparent discrepancy between dose rate calculations provided in the LAR and NRC staff calculations, or provide a revised dose rate calculation.

RAI 8

The licensee provided a single dose rate calculation in its July 1, 2009, memorandum as the highest dose rate anticipated at the 701' elevation, when the FESW is drained to its lowest level (approximately 680 foot elevation) to allow for cask movement and preparation. NRC staff does not consider a single dose rate calculation to adequately represent the potential worker doses for the operations proposed. The licensee did not provide adequate information on operations (e.g., change in water levels, and thus the shielding provided, during each phase of the operation and the estimated time for each phase of the operation), to determine anticipated occupational doses that may be accrued during the proposed operations.

The licensee also did not provide adequate information to support its claim that the proposed fuel loading operations per this license amendment request (to lower water levels in the FESW, allowing the fuel transfer canal gate to be removed at the onset of the dry run and not be reinstalled for the remainder of the cask loading operations) will result in lower occupational doses than the operations per the current TS (where the fuel transfer canal gate would need to continually be removed and reinstalled throughout loading operations to maintain the current 16 feet minimum water coverage above fuel, per TS 4.1.2.a.).

Please provide an estimate of occupational doses, using applicable dose rates and anticipated time for each phase of the loading operations, expected to be accrued during: (a) the proposed operations per the license amendment request and proposed changes to TS (i.e., lower water levels in the FESW); and (b) the operations per the current TS (i.e., continued removal/reinstallation of fuel transfer canal gate throughout operations to maintain 16 feet minimum water coverage above fuel, per current TS 4.1.2.a).

RAI 9

In the discussion of the impacts on accident analysis, the license amendment request notes that the level of water in the FESW is not a factor in this accident analysis since the accident analysis of record does not credit decontamination in the FESW water. The NRC staff reviewed the accident analysis as described in the December 2008 Decommissioning Plan (DP) and requests the following information regarding the analysis of record.

The spent fuel accident analyses described in the DP only consider the release of krypton-85 for which water decontamination is not a consideration. The analyses do not consider the release of iodine-129 (¹²⁹I) for which water decontamination would be a factor.

- a. Please provide additional information describing the basis for not considering the release of ^{129}I in the spent fuel accident analyses described in the DP. Please provide additional information describing the impact of the reduced water level if the release of ^{129}I is considered in the dose consequence analysis.

The NRC staff notes that the dose consequences of the spent fuel accidents described in the DP are compared to the 25 rem whole body dose from 10 CFR Part 100. The dose consequences from fuel handling accidents are expected to be well within the limits of Part 100. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition" (SRP) Section 15.7.4, "Radiological Consequences of Fuel Handling Accidents," defines "well within" as 25 percent or less of the 10 CFR Part 100 exposure guideline values (i.e., 75 rem for the thyroid and 6 rem for the whole-body doses).

- b. Please provide additional information to justify the use of an acceptance criteria value of 25 rem whole body rather than the SRP value of 6 rem whole body.