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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

November 1, 1978

Docket No. 50-409

Dairyland Power Cooperative
ATTN: Mr. John P. Madgett
General Manager
2615 East Avenue, South
La Crosse, Wisconsin 54601

Gentlemen:

We have completed a preliminary review of your submittals dated August 7, September 25, and October 4 and 16, 1978, regarding your proposed modifications to the spent fuel storage facility at the La Crosse Boiling Water Reactor, LACBWR. We find that additional information is required to continue our review.

Please provide responses to the items identified in the enclosure.

Sincerely,

Dennis L. Ziemann

Dennis L. Ziemann, Chief
Operating Reactors Branch #2
Division of Operating Reactors

Enclosure:
Request for Additional Information

cc w/enclosure:
See next page

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LA CROSSE BOILING WATER REACTOR
DOCKET NO. 50-409
REVIEW OF PROPOSED SPENT FUEL STORAGE EXPANSION
REQUEST FOR ADDITIONAL INFORMATION

1. Provide drawings showing (1) the interlock between the upper tier rack and lower tier rack sections, (2) the seating surfaces and fuel assembly support plate in the upper egg crate grid of the lower tier rack, and (3) the adjustable pads, used to transmit horizontal seismic loads, and their locations on the rack structures.

2. Regarding the rack structural analysis provided in your August 7 submittal:

   (a) Load combination (5), D+T+U.L, should be D+L+U.L with a structural acceptance limit of 1.5S. Therefore, the design report, NES 81A0546, Rev. 2, should be revised accordingly. Indicate whether a stuck or jammed fuel assembly will result in higher stresses than assuming the grapple gets hooked on a fuel storage cell. Also, justify applying the load to a lower rack grid structure versus an upper grid structure or other possible locations along the length of a storage cell.

   (b) Regarding Load Case 6, Assembly Drop Impact Load:

      (i) What is the basis for assuming a drop height of 89 inches?

      (ii) The assembly drop impact load should be combined with D+L with the resultant gross stress level less than 1.5S. Local stresses may be greater in accordance with the acceptance criteria stated on page 6-1.

      (iii) For drop possibility (3), straight drop through a storage cell, it is stated that the fuel assembly will slightly perforate the cell base plate. It is also stated that since the kinetic energy will be absorbed by bending of the base plate, shearing of the base plate weld, and deformation of the rack base structure, the reaction load transmitted to the rack base structure, rack feet and pool floor is less than that for the fuel assembly drop on top of the storage cell. An analysis was then performed for a free fall of 9.0 inches. Justify your statement on page E-17 that the entire kinetic energy of the falling fuel assembly is absorbed in shearing the welds and deforming the base plate. Explain why the remaining kinetic energy is expended deforming the base plate, i.e., justify the derivation of δ as shown on page E-17. Indicate the actual thickness of a cell base plate.

(iv) Drop possibility (3), straight drop through the storage cell, should be examined for (1) a drop at the most flexible location of the rack, and (2) a drop over one of the support feet. In the latter case, the reaction load will be almost entirely transmitted through the one support foot and could be the limiting case for bearing sizing and punching shear stress applied to the pool floor. Please provide the results of your examination of these two drop locations.

(v) Also, analyses for drop possibility (3) should be done for drops assuming the fuel assembly support plate in the upper egg-crate grid of the lower tier rack is in place. If this plate is perforated the falling fuel assembly could strike the assembly stored in the lower tier rack section. Please provide analysis for this case.

(vi) Appendix E cites reference 1 for increase of dynamic yield stress above static for stainless steel. State what this reference is since it is not listed on page E-19 with the other references.

3. Page B-11 of the cask drop analysis, NES 81A0550, Rev. 2, submitted on September 25, indicates that the support legs can sustain a maximum load of 72.72 Kips. However, page E-6 of document NES 81A0546, Rev. 2, submitted August 7, shows the same leg transmitting a reaction load of 95 Kips. Clarify this apparent inconsistency. Also, page E-7 shows a jackscrew compressive thread area of 1.405 in^2 versus the 1.757 in^2 shown on page B-11. Please clarify this difference. Where is the 6" diameter base plate referred to on page E-8 located? Why is the thickness of 8.5" bearing plate multiplied by 2 in the punching stress calculation on page B-11 and not on page E-8? Why does acceptance criteria for concrete floor bearing stress differ on pages E-8 and B-11? What is reference 7 cited on page E-8? What is reference 5 cited on page B-11?

4. It is stated on page 5-2 of your August 7 submittal, NES 81A0546, Rev. 2, that thermal loadings are insignificant because of the clearances provided to accommodate a maximum pool temperature of 150 F. State the maximum normal and accident pool temperatures that can be expected and whether rack expansion is provided for under the maximum accident temperature that the pool water could reach. Provide justification for not considering these clearances in the seismic analyses and specify the magnitude of the clearances. Although rack expansion may be provided for, indicate the maximum thermal gradient that can develop between adjacent fuel storage locations, the magnitude of the resultant stresses, and justify your statement that these stresses are not significant.

5. With reference to question 4, discuss the necessity of evaluating load combinations not addressed in the submittal, i.e., load combinations b.(i) (6), b.(i) (7), and b.(i) (8) on page 3.8.4-8 of the Standard Review Plan. These factored load conditions include loads due to accident temperature effects.

6. Indicate where the yield stress, 30.0 ksi, for stainless steel is taken from and at what temperature.

7. It is stated on page 3-2 of NES 81A0546, Rev. 2, submitted August 7, that the fuel storage racks and associated seismic bracing are fabricated of Type 304 stainless steel. However, on page 8-12 there is a note referencing 17-4 pH stainless steel. Indicate whether this material is being utilized. If so, state where it is being used, where the yield stress is taken from and at what temperature. Also provide the heat treatment temperature, and specify that the pieces will be hardness tested to verify heat treatment and either pickled or grit blasted to remove the surface film resulting from the heat treatment.

8. If any materials other than type 304 or 17-4 pH stainless steels are being used, list the materials along with their yield strength, where the yield strength is taken from and at what temperature.

9. Provide the basis for the acceptance criteria, 0.5Fy (shear) and 0.9Fy, given on page 6-1 of NES 81A0546, Rev. 2.

10. Provide the acceptance criteria for weld stresses.

11. Provide the water chemistry which will be maintained in the spent fuel pool. Include the boron concentration, pH, chloride, fluoride and any heavy metal concentrations.

12. Discuss how the effects of fuel assembly "rattling" are accounted for, i.e., indicate if the generated loads and resultant stresses are added to the other stresses in all the combinations that include seismic loads, whether all storage cells are assumed to contain fuel and if all the fuel assemblies are assumed to move in phase. Also, indicate the gross and local stresses in the racks due to this "rattling" and demonstrate that the fuel assemblies themselves will retain their structural integrity and will not suffer cladding damage as a result of impacting the storage cell.

13. Provide details of the pool modification phases and indicate whether all racks will be seismically supported during all phases.

14. The structural analysis report, NES 81A0095, Rev. 1, submitted October 4, does not include all the load combinations found on page 3.8.4-7 of the Standard Review Plan. Specifically, provide justification for not considering load combinations a.(ii) (2b'), a.(ii) (3b') and b.(4) thru b.(8). Also, indicate whether both cases of L having its full value or being completely absent were checked.

15. Load combination (5), given on pages 5-2 and 8-7 of NES 81A0095, Rev. 1, does not agree. Indicate which combination was examined.

16. Indicate where the value for the compressive strength of concrete was obtained.

17. Since the water level in the spent fuel pool must now be maintained above the refueling canal gate, indicate whether gate seal integrity can be maintained under seismic conditions. If not, discuss the consequences.

18. The loading due to water sloshing during a seismic event must be included in the analysis of the pool structure. Indicate how these loads have been accounted for.

19. Based on discussions with your staff it is our understanding that the spent fuel pool drain line is not seismic category I piping. Therefore, unless modifications are made, e.g., rerouting the line and permanently sealing the drain or seismically qualifying the piping, it must be assumed the piping fails during an earthquake. Please prcvide detailed drawings of your planned modifications and associated seismic analyses.

20. Section 6. of the Cask Drop Analysis, NES 81A0550, Rev. 2, submitted September 25, presents the structural acceptance criteria for the three load cases examined. If U is the stress limit for the concrete, explain the remaining limits given on page 6-1. Also, clarify the acceptance criteria for Load Case 3.

21. Discuss the possibility of the cask dropping such that it directly impacts or is deflected onto the refueling canal gate. If the gate may be struck by the cask, and since the pool water level will now be above the gate, indicate whether gate and/or seal integrity will be maintained. If not, discuss the consequences with regard to (1) spent fuel and (2) plant equipment in areas that may receive the leaking pool water.

22. It appears that none of the cask drop analyses performed examined the possibility of striking along an edge or corner of the cask. These type of drops may lead to more severe damage of the crash pad, pool liner and floor, or racks. Provide analyses considering these type of drops or a detailed justification for not doing so.

23. For the 3/8" stainless steel barrier plate that is to be provided under the storage racks, clarify the locations in the pool where the plate will be provided, if the plate is one piece or several smaller plates, and the exact material of the plate.

24. Justify the assumption that only 52 storage cells can be impacted by a dropped cask since the cask will not necessarily strike the rack in a vertical position.

25. The cask drop analysis, NES 81A0550, Rev. 2, submitted September 25, references NES document 81A0426, Rev. 1, dated March 31, 1976. Was this document ever submitted to the NRC, and if so, when?

26. In Attachment "A" to DPC letter LAC-5498, dated October 16, 1978, it is stated that the poison material selected for use in the new racks is a B_4C/Polymer Composite manufactured by the Carborundum Company. Please provide the following information:

(a) What is the melting temperature of the B_4C/Polymer Composite material?

(b) What will the maximum integrated neutron and gamma flux be in the boron containing material over the lifetime of the racks? What spent fuel assembly power density and burnup, and what rack life were assumed in calculating these maximum integrated fluxes?

(c) What will the maximum temperature be in the center of the boron material, assuming the highest neutron and gamma flux and the worst accident conditions?

(d) What will the chemical composition of the boron containing material be after receiving the design dose of irradiation?

(e) Provide the acceptance criteria for mechanical strength of the poison plates, including the basis for the criteria, and specify the minimum (or maximum) acceptable values for the modulus of rupture, modulus of elasticity, and ultimate tensile strength.

(f) Submit the results of testing which show that the composite poison plates will retain acceptable levels of mechanical strength, in accordance with the criteria discussed above, throughout their service lifetime when exposed to the maximum expected radiation dose level, dose rate, and pool water environment.

(g) Submit results of testing and/or analyses which indicate that these composite poison plates will maintain their structural integrity during a vibratory environment such as can be expected during an SSE.

(h) State your plans for periodic monitoring of the composite of the poison plate material to ensure test results correlate with actual LaCrosse spent fuel pool conditions with regard to possible corrosion and mechanical strength deterioration.

(i) Provide data to show that, under the combined effects of irradiation and immersion in fuel pool water, the leachability of the boron will not be synergistically enhanced over the life of the high density storage racks.

(j) Provide data that shows that the high dose rates used for accelerated irradiation tests have the same effect on the boron plates as the lower dose rates that will be received in the spent fuel pool.

(k) Provide assurance that adequate venting at the ends of the plates will prevent swelling due to trapped gas in the central portion of the composite plates

(l) Describe the surveillance program that will be performed to show the continued presence of the boron in all of the boron plates over the complete life of the storage racks, and also describe what action would be taken if a decrease of boron in the plates is detected.

(m) How many of the neutron absorber plate locations will be checked during the onsite blackness test?