



NAC-MPC Amendment 7 LACBWR Enhancements

NRC Docket No.: 72-1025

September 6, 2017

Objectives and Outline

- Objective
 - Provide an overview of the previously approved LACBWR storage system and licensing basis
 - Discuss the proposed amendment application and scope of changes
- Outline
 - LACBWR storage system design and licensing basis
 - Existing licensing basis thermal evaluations
 - Current surveillance requirements for verifying the concrete cask heat removal system is operable
 - Proposed changes to the surveillance requirements for the concrete cask heat removal system
 - Additional related changes
 - Schedule for submittal

NAC-MPC LACBWR Storage System

- The NAC-MPC LACBWR system is variant to the base NAC-MPC system design
- LACBWR is short for the La Crosse Boiling Water Reactor, which is located near La Crosse, Wisconsin
- The reactor was a demonstration power reactor that was built in 1967 with a total power output of 50 MWe
- In 1973 the reactor and fuel license were transferred to the Dairyland Power Cooperative (DPC)
 - In 2016, the license was temporarily transferred to La Crosse Solutions LLC who will complete the decommissioning efforts; thereafter, the license will be transferred back to DPC
- The reactor was shut down in 1987 and placed in SAFSTOR in 1991
- In 2007 the reactor pressure vessel and other low-level, non-fuel waste was removed and shipped off-site for disposal

NAC-MPC LACBWR Storage System (cont'd)

- As part of continued decommissioning, NAC was contracted to provide the dry cask storage system for LACBWR in order for the fuel pool to be emptied of spent fuel
- NAC submitted an application to the NRC in 2009 for approval of a new variant to the NAC-MPC system which supported the fuel inventory at LACBWR
 - Fuel to be stored was BWR fuel made by Exxon and Allis Chalmers
 - Many of the fuel assemblies were characterized as damaged
 - Required new basket design, damaged fuel can design, etc.
 - Basket design accommodates up to 68 fuel assemblies with a maximum decay heat of 63 Watts per assembly (i.e., < 4.5 kW per canister, as analyzed)

NAC-MPC LACBWR Storage System (cont'd)

- The NRC subsequently approved the amendment application in 2010
- LACBWR began loading storage systems thereafter and completed the transfer of fuel to dry storage in 2012
 - A total of 5 dry cask storage systems were used for 333 fuel assemblies
- Remainder of facility is continuing through the decommissioning process and the ISFSI is actively being maintained by DPC

Licensing Basis Thermal Evaluations

- The NAC-MPC LACBWR storage systems are storing very old and cold fuel
- Licensing basis heat load is 4.5 kW per canister for the LACBWR contents
 - Note, typical storage systems are licensed for much higher heat loads
- The design of the concrete overpack, which stores the transportable storage canister (TSC), is a traditional vertical design that is ventilated and allows for convective cooling of the canister shell
 - There are inlet vents at the bottom of the vertical concrete overpack and the outlet vents are at the top
 - Both sets of vents have screens installed to protect the inlet/outlet regions

Licensing Basis Thermal Evaluations (cont'd)

- During development of the new NAC-MPC LACBWR design, NAC decided not to take credit for conduction or convective heat transfer between the canister shell and concrete overpack liner because the canister heat load is so low
- The existing licensing basis thermal evaluations model the annulus region between the canister and overpack as a void space, which allows for radiative heat transfer from the canister shell to the concrete overpack liner (SAR Section 4.A.3 and Amd. 6 SER Section 4.2)
 - In other words, the design allows for convective heat flow but is not analyzed to take credit for this nor does it credit conductive heat transfer across the annulus space
 - The system is just so cold that it doesn't need either of these heat transfer modes in order to meet temperature allowables for the canister or contents

Licensing Basis Thermal Evaluations (cont'd)

- Even though no credit for convective cooling is needed for the canister and contents nor is it analyzed with this credited, the existing surveillance requirements for verifying the concrete cask heat removal system is operable are derived from the base NAC-MPC design (SAR Section 4.A.3.3.1)
 - These are based thermal evaluations for a bounding case (i.e., the base NAC-MPC 12.5 kW heat load model)
 - This was done because the thermal method of evaluation for LACBWR results in local and bulk concrete temperatures exceeding allowables (i.e., $222^{\circ}\text{F} > 200^{\circ}\text{F}$ and $168^{\circ}\text{F} > 150^{\circ}\text{F}$, respectively)
 - In order to readily obtain the amended certificate, NAC elected to not revise the existing thermal evaluation; instead NAC simply relied on the results of an existing licensed bounding case within the NAC-MPC FSAR (i.e., the 12.5 kW case which credited convective cooling, etc.)
- Since no air or air flow is modeled between the canister and concrete cask liner, the analysis for the normal storage condition bounds any analysis for off-normal, half-inlet blocked condition, and the accident condition of all vents blocks for the canister and contents (SAR Section 4.A.3)
- Analysis of the blockage of all vents (i.e., SAR Section 11.A.2.8.2) is bounded by the normal condition of storage temperatures
 - The canister and contents can endure this condition indefinitely (SAR Table 4.A.3-3)

Current Surveillance Requirements

- The current surveillance requirements for verifying the concrete cask heat removal system is operable allows for remote temperature monitoring or visual inspection
 - Daily measurement of temperature difference between the average concrete cask outlet temperatures and the ISFSI ambient temperature
 - This temperature difference is the same as the Yankee-MPC (i.e. $< 92^{\circ}\text{F}$) since it is the base case as described on the previous slide
 - Daily visual inspection of all inlet and outlet vents to verify they are unobstructed

Proposed Changes to Surveillance Requirements

- In order to support changes to the existing surveillance requirements and frequency, NAC will revise the existing thermal evaluation for LACBWR to demonstrate the concrete temperatures are below allowables
 - Existing model has the following conservatisms that can be revised
 - Current evaluated heat load is 4.5 kW, which is higher than the current heat loads
 - The radiation view factor currently used is 0.197 for a multi-array cask; this should be revised to 1.0
 - The bottom of the cask is currently treated as adiabatic; this should be modeled as being in contact with shaded concrete
 - The existing film coefficient modeling convective cooling of the outside of the concrete cask is overly conservative
 - The concrete rebar is not currently modeled; this should be modeled as it provides significant conductivity benefits vs. pure concrete; this enhances conductive heat transfer from the inside of the overpack to the outside environment
 - Depending of the results of these changes, one or more may be used to show the concrete temperatures are below allowables
 - The revised evaluation needs to drop the local peak temperature by at least 22 °F and the average temperature (i.e., bulk) needs to drop by at least 18 °F
 - Since the existing temperatures are so close to the allowables already, NAC does not expect a lot of changes to the conservative assumptions in the model
 - No changes need to be made to the existing canister and contents thermal evaluation as it is already in the licensing basis that the vents are not needed

Proposed Changes to Surveillance Requirements (cont'd)

- Along with the existing licensing basis for the canister and contents, including a revised thermal evaluation for the concrete overpack demonstrating the local and bulk temperatures will not exceed allowables, NAC is proposing to modify the existing surveillance requirements by:
 - Adding a note to LCO 3.1.6 stating this is not applicable to the MPC-LACBWR CANISTER
 - Revising the tech spec bases explaining why this is the case
 - Adding an annual maintenance requirement to visually inspect the vents for obstructions and clearing them as needed
 - Adding the supporting thermal evaluations for the concrete to the SAR
- An additional related change is revising the license drawing detailing the mesh of the inlet/outlet screens to allow for a finer mesh, which reduces the ability for small insects to get into the vents

Schedule

- NAC as completed the draft submittal minus the revised thermal evaluation for the concrete overpack
- Once NAC incorporates the revised thermal evaluation, the submittal will be ready
- NAC is schedule to provide a final submittal to the NRC by the end of 2017

QUESTIONS?