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PY-CEI/NRR-2505L

United States Nuclear Regulatory Commission
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Perry Nuclear Power Plant
Docket No. 50-440
Supplemental Letter To License Amendment Request Regarding A Modification To The Emergency Service Water Alternate Intake Sluice Gates

Ladies and Gentlemen:

This letter supplements the license amendment request submitted on June 1, 2000 (PY-CEI/NRR-2492L), regarding a proposed modification to the alternate intake Sluice Gates for the Emergency Service Water (ESW) system. Within the letter submitted June 1, 2000, pursuant to 10 CFR 50.59, the Perry Nuclear Power Plant (PNPP) staff requested NRC review and approval for the use of a non-safety seal along with the installation of a switch that defeats the automatic opening feature of the ESW Sluice Gates. This letter provides clarification for the use of the non-safety Sluice Gate seal and withdraws the PNPP staff's request for NRC review and approval for this portion of the license amendment request.

Attachment 1 provides the necessary clarification to the June 1, 2000, amendment request. The original Significant Hazards Consideration bounds the clarification provided by this supplemental letter. Attachment 2 provides replacement Updated Safety Analysis Report pages annotated to reflect this clarification.

If you have questions or require additional information, please contact Mr. Gregory A. Dunn, Manager - Regulatory Affairs, at (440) 280-5305.

Very truly yours,

for John K. Wood

Attachments

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III
State of Ohio

A001

CLARIFICATION FOR JUNE 1, 2000, LICENSE AMENDMENT REQUEST (Perry Letter PY-CEI/NRR-2492L)

The following information clarifies the June 1, 2000, license amendment request submitted by the Perry Nuclear Power Plant (PNPP) staff.

Within the June 1, 2000, license amendment request, the PNPP staff requested NRC review and approval, in accordance with 10 CFR 50.59, of a modification that installs non-safety components to inflate and maintain inflation of elastomeric seals around the Emergency Service Water (ESW) Sluice Gates. After further review and discussion with the NRC staff, the PNPP staff withdraws its request for NRC review and approval for the use of the proposed non-safety components, which includes the elastomeric seals and those supporting components that inflate the seals.

Because these non-safety related components have a safety-related function to maintain ESW temperature limits, temporary use of the proposed elastomeric seals and the supporting inflation system will be evaluated as a non-conforming condition under PNPP's Quality Assurance Program pursuant to 10 CFR 50, Appendix B requirements. The PNPP staff will address use of the non-safety seals and inflation system and the non-conforming condition within the site's corrective action program. However, use of the proposed modification, i.e., inflation of the elastomeric seals, is contingent upon NRC approval of the remaining portion of the amendment request that includes the use of a switch that will allow defeating the automatic opening feature of the ESW Sluice Gates for up to five months per year. The original Significant Hazards Consideration bounds the clarification provided by this supplemental letter.

Since use of a non-safety elastomeric seal and inflation system is considered a non-conforming condition, this configuration is considered temporary and will be permanently addressed by the following action:

> The PNPP staff will upgrade the elastomeric seal and associated inflation system (inclusive of the upstream instrument air check valve [0P45-F0004A/B]) to safety grade in accordance with 10 CFR 50 Appendix B requirements for components important to safety prior to relying on the seal, during the summer of 2001.

The following information supplements the referenced license amendment request and provides information, which supports the acceptability of the temporary use of the proposed non-safety elastomeric seals and inflation system.

SEAL SAFETY FUNCTION

The function of the sluice gates in the closed position is to provide a barrier between water in the discharge tunnel and water in the ESW forebay. The sluice gate seals, while in the inflated state, serve to minimize leakage from the discharge tunnel into the forebay. For conditions when lake temperature is elevated, sluice gate leakage must be limited during accidents when the ESW system is operating and ESW discharge water is returned to the lake via the discharge tunnel. ESW cannot exceed its maximum allowable temperature in order to assure that the safety related systems and components that are cooled by ESW are capable of performing their safety functions.

FAILURE MODES AND EFFECTS ANALYSIS

The inflatable seal is manufactured from fabric reinforced Ethylene Propylene Diene Monomer (EPDM). The seal wall thickness is a nominal 0.109 inches. Seals (including fabric reinforced inflatable seals) made from EPDM are used in many applications and have demonstrated reliable and durable operating characteristics. According to the manufacturer, examples of installations involving similar seals include watertight doors, airtight doors, blast doors, and flood barrier gates. EPDM displays good tear resistance and proves durable when exposed to abrasion and other forms of mechanical wear. During a seismic event, the inflatable seal would act as a shock absorber, and given its resistance to tears and abrasion, engineering judgment concludes that the seal would remain intact during a seismic event and remain capable of performing its function. Further, EPDM is an excellent general purpose material with a serviceable temperature range of -60°F to 300°F. This temperature range well encompasses the expected service temperature range of the sluice gate seals (32°F to 125°F). Immersion tests of EPDM demonstrate a very low degree of water absorption. The seals have a ten year service life based on vendor recommendations for the service environment. These qualities demonstrate that the inflatable sluice gate seals are well suited for their application. (Reference Seal Master Corporation)

The seal retainers are seismically attached. The resulting stresses in the retainer hardware due to a seismic event are negligible compared to their allowables. Therefore, these components will remain attached to the gates during a seismic event. Since the seal is captured and held in place by the retainer and is constrained by the sluice gate channel, engineering judgement concludes that the seal would remain attached to the gate during a seismic event.

In the unlikely event of a destructive failure of an inflatable seal or retainer, it would not challenge operation of the ESW pumps. Any potentially damaging elastomeric seal parts or metallic retainer parts would either sink to the bottom of the forebay or be captured by the 3/8-inch openings of the traveling screens.

The air supply to the seals is provided from two sources. One source is the normal plant, non-safety instrument air system. The second source is compressed air cylinder(s). Both air supplies are connected to the seals via seismically supported lines. The connection from the compressed air cylinder(s) is downstream of two check valves so that on loss of the instrument air supply, the compressed air cylinder(s) maintain inflation of the seal.

The check valves installed in the instrument air supply line, upstream of the back-up compressed air cylinder(s), are ½" nominal size spring and poppet check valves. The internal components of the check valves are adequately contained within the body of the valve such that the accelerations that would be imposed on the valves during a seismic event would not create forces large enough to dislodge the internal components. The integrity of these check valves will be verified prior to inflation of the seals. Therefore, it is concluded that the check valves would remain intact and be capable of performing their intended function after a seismic event. Additionally, while the seals are inflated, the seal and air supply integrity will be verified twice daily as follows:

1. By checks of the seal air pressure.
2. By verification that the air flow is below a set value and the compressed air cylinder(s) pressure is sufficient to ensure the availability of at least 24 hours of air.
3. By measuring ESW forebay temperature to monitor seal bypass flow.

A seismic event is not expected to cause failure of the seal or air supply system, and periodic verification of seal integrity provides assurance that the seal and sealing system will be intact when required to perform a safety function. Further, as stated in the original submittal of June 1, 2000, failure of the seal coincident with elevated lake temperature has been demonstrated to be highly improbable. In conclusion, the seal is of high quality material and is not expected to fail.

LOSS OF COOLANT ACCIDENT (LOCA) OR SAFE SHUTDOWN EARTHQUAKE (SSE) CONCURRENT WITH SEAL FAILURE

With failure of the seals, it is estimated that the ESW temperature would increase by approximately 3.5°F. Since the actual fouling of the heat exchangers as tested in accordance with GL 89-13, "Service Water System Problems Affecting Safety-Related Equipment", is less than the design allowable, any decrease in heat removal capability as a result of this increase in ESW temperature would be largely offset by the available operating margin. If the use of both the A and B trains of ESW and associated Emergency Core Cooling Systems (ECCS) is assumed, this would offset the effects of higher ESW temperature. This would result in a much greater distribution of the heat loads, a significant increase in the heat removal capability, and a decrease in the temperature of the discharge water, reducing the effect of the sluice gate bypass leakage.

There is additional defense in depth as a result of the conservatisms inherent in the design basis analyses. The worst case accident scenario relies on a single loop of ESW to remove all heat loads during a Design Basis Accident (DBA), i.e., Loss of Offsite Power (LOOP)/LOCA/SSE. The analyzed scenario includes the following conservatisms:

- Single loop of ESW/ECCS (this is the minimum ECCS scenario)
- Design basis maximum heat loads
- ESW Pump flow is degraded from the design basis nominal flow rate to verify that under all conditions the design basis maximum heat load can be removed. These pump flow analytical degradations include:
  - Pump speed reduction to account for diesel generator (DG) frequency tolerance
  - Additional backpressure to account for discharge to the swale
  - Reduction in pump suction elevation to account for maximum possible lake setdown effects combined with minimum lake levels
  - Constant maximum strainer pressure drop
  - Pump performance degradation
  - Flow degradation based on instrument loop uncertainty and accuracy
  - Heat exchanger pressure drops increased to account for additional plugging and fouling

The degraded ESW pump/system conditions result in a decrease in analyzed ESW system flows of approximately 14%. These are degraded from the nominal required flow rates to verify that the design heat loads can still be removed with these postulated conditions. Also, there are many conservatisms inherent in the design maximum heat loads.

For instance, the design heat load for the DG is based on original specified maximum heat loads, which have been shown to be very conservative during DG testing. An increase in ESW temperature would not likely have an effect on jacket water temperatures, based on the heat removal margin.

The design heat load for the Emergency Closed Cooling (ECC) heat exchanger is based on the various chillers served by this heat exchanger. For instance, the Control Complex chillers which comprise approximately 90% of the ECC heat load are each 100% capacity chillers specified on the basis of two operating plants (Unit 1 and Unit 2). The originally specified chillers have considerable margin for heat load removal to support single plant operation.

For the Residual Heat Removal (RHR) heat exchangers, existing operating margin involving fouling factors and actual expected ESW flow rates would tend to offset any small decrease in heat removal rate caused by the elevated ESW temperatures such that the containment design parameters would not be exceeded. However, conservatively ignoring this available operating margin (i.e. assuming worst case design conditions), the 3.5°F increase in ESW temperature would result in a <5% reduction in heat removal capability at the time Suppression Pool Cooling is placed into service during the DBA event. This would tend to result in the peak long term suppression pool temperature occurring slightly earlier into the event and remaining at this peak temperature for a little longer period of time, prior to decreasing.

The peak pool temperature is also expected to increase slightly but remain below the 185°F design limit. The most limiting containment response analysis for long term suppression pool temperature is based on a Recirculation Suction Line Break. This analysis resulted in a peak temperature of 180.3°F (Reference NEDC-32907P, "Safety Analysis Report for Perry 5% Thermal Power Uprate"). Thus, the available margin to design is 4.7°F.

A sensitivity analysis evaluated the effect of an approximately 3.5% reduction in the RHR heat exchanger heat removal capability during an accident. The resultant accident peak suppression pool temperature increased approximately 1°F. As such, the reduction in heat removal capability caused by the elevated ESW temperature is expected to maintain peak suppression pool temperature less than the 185°F design maximum.

Therefore, if the seals were postulated to fail during a LOOP/LOCA/SSE, with an additional single failure, no design limits are expected to be exceeded.

COMMITMENTS

The following are the regulatory commitments made in this letter and are in addition to those made in the June 1, 2000 license amendment request. Any other actions discussed in this document are not regulatory commitments and represent intended or planned actions that are described for the NRC's information. Please notify the Manager, Regulatory Affairs at the PNPP of any questions regarding this document.

Since use of a non-safety elastomeric seal and inflation system is considered a non-conforming condition, this configuration is considered temporary and will be permanently addressed by the following action:

> The PNPP staff will upgrade the elastomeric seal and associated inflation system (inclusive of the upstream instrument air check valve [0P45-F0004A/B]) to safety grade in accordance with 10 CFR 50 Appendix B requirements for components important to safety prior to relying on the seal, during the summer of 2001.

"This page supercedes previous markup, Attachment 3 page 4 of 9, as submitted in June 1, 2000 letter"

PARAGRAPH TO INSERT ON PAGE 9.2-5;

The sluice gates provide a barrier between the discharge tunnel and the ESW pump house forebay to prevent recirculation of plant discharge water thereby maintaining the ESW forebay at or below its maximum allowable temperature of 85°F during all modes of plant operation including accident and transient mitigation. The sluice gate seals also form part of this barrier when elevated lake temperature may cause the ESW forebay to approach its design temperature limit and the seals are inflated.

"This page supercedes previous markup, Attachment 3 page 9 of 9, as submitted in June 1, 2000 letter"

"No changes are required on this page"

15.0.1 ANALYTICAL OBJECTIVE

The spectrum of postulated initiating events is divided into categories based upon the type of disturbance and the expected frequency of the initiating occurrence; the limiting events in each combination of category and frequency are quantitatively analyzed. The plant safety analysis evaluates the ability of the plant to operate within regulatory guidelines, without undue risk to the public health and safety.

This chapter addresses two types of operating conditions addressed by the Code of Federal Regulations. It compares the radiation releases from anticipated operational transients to the 10 CFR 20 limits on the "anticipated average radiation levels." The consequences of very unlikely events (faulted events) are compared to the 10 CFR 100 limits (for the design-basis RAST LOCA analysis, the licensing basis offsite dose limit is 25 rem TEDE). The analyses described in this chapter show that the consequences for these two types of events are less severe than the corresponding 10 CFR limits.

Unless otherwise identified, it is assumed that all equipment (safety grade or nonsafety grade) is available to mitigate the transients described and analyzed in this chapter. However, only safety grade equipment is assumed to be used to mitigate accidents and safely shut down the reactor.