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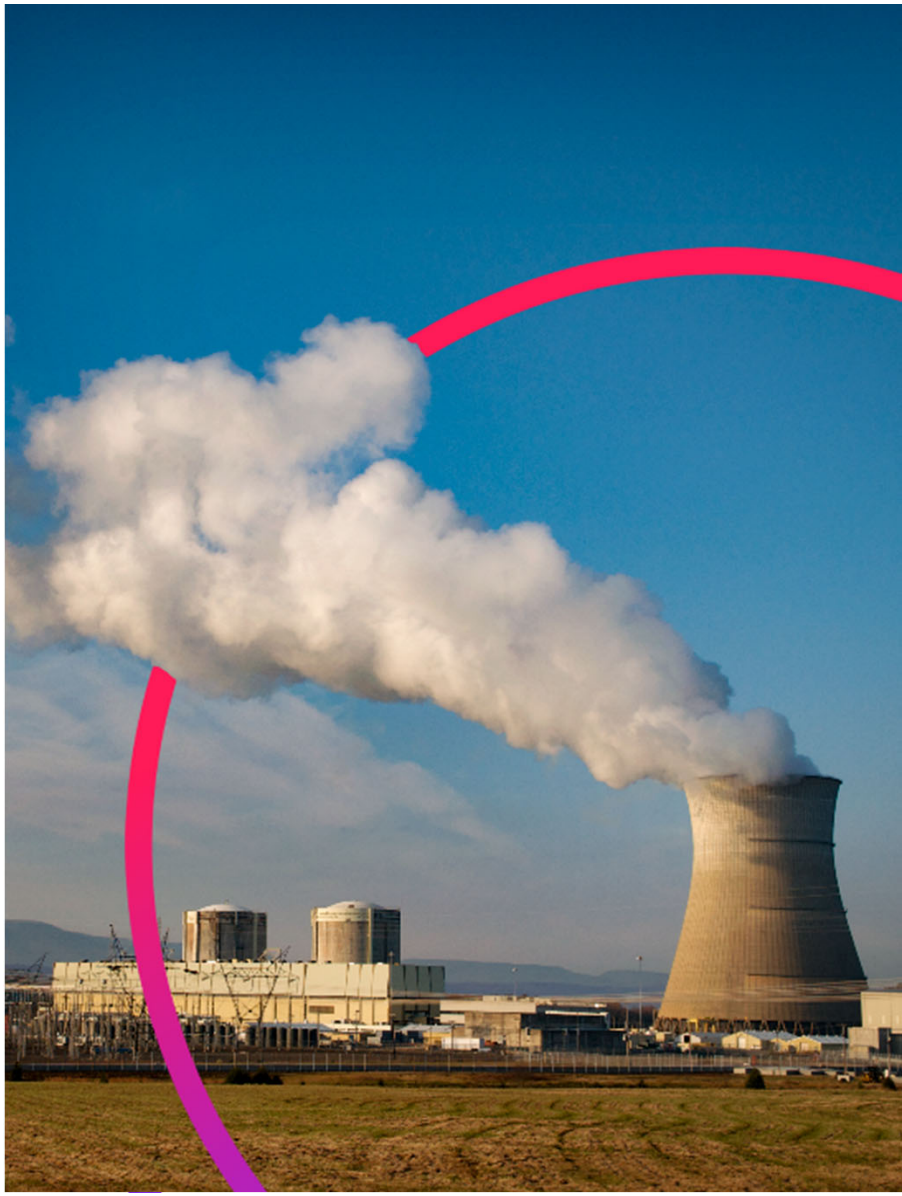
Arkansas Nuclear One (ANO) Unit 1
Pressurizer Heaters License Amendment Request
NRC Pre-Submittal Meeting

August 15, 2023



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Background

Confirmatory Order issued to ANO Unit 1 (ANO-1) on January 2, 1980 (ML021220215), to implement the requirements contained in NUREG-0578, “TMI-2 Lessons Learned Task Force Status Report and Short-Term Recommendations,” with clarification in NUREG-0737, “Clarification of TMI Action Plan Requirements,”

In 3Q22, ANO-1 received a Green non-cited violation of the Confirmatory Order requirements (ML22312A527, dated November 9, 2022).

- **1st issue**: Measured pressurizer ambient heat losses exceeded the predetermined pressurizer heater capacity needed to establish and maintain natural circulation at hot standby conditions when offsite power was not available.

- **2nd issue**: In the event of a loss of offsite power with failure of B-train emergency power, manual operator actions outside the main control room are required to restore power to the minimum-required pressurizer heater capacity powered by A-train emergency power.

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Current Requirements

TMI action item II.E.3.1, “Emergency Power Supply for Pressurizer Heaters”, included the following position:

- *(1)The pressurizer heater power supply design shall provide the capability to supply, from either the offsite power source or the emergency power source (when offsite power is not available), a predetermined number of pressurizer heaters and associated controls necessary to establish and maintain natural circulation at hot standby conditions. The required heaters and their controls shall be connected to the emergency buses in a manner that will provide redundant power supply capability.*

Clarification (2) associated with this requirement states:

- *The number of heaters required to have access to each emergency power source is that number required to maintain natural circulation conditions in the hot standby condition.*

Additionally, Clarification (4) states:

- *Any changeover of the heaters from normal offsite power to emergency onsite power is to be accomplished manually in the control room.*

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Current Requirements

The requirements for the pressurizer heaters are documented in the ANO-1 Updated Final Safety Analysis Report (UFSAR).

UFSAR Section 4.2.4.4 – Pressurizer Heaters

Each diesel generator emergency bus supplies emergency power to 168 kW of pressurizer heaters. Two separate sets of heaters totaling 84 kW each are supplied by the diesel generators. The remaining 84 kW is powered from a swing bus which can be supplied by either diesel generator. This ensures emergency power redundancy to sufficient heater capacity to establish and maintain pressure control at hot standby during a loss of offsite power.

Proposed Changes to 1980 Confirmatory Order

Entergy intends to submit a License Amendment Request (LAR) to modify the 1980 Confirmatory Order. The current design was adopted to comply with the 1980 Confirmatory Order.

Position (1)

- *The pressurizer heater power supply design shall provide the capability to supply, from either the offsite power source or the emergency power source (when offsite power is not available), a predetermined number of pressurizer heaters and associated controls necessary to establish and maintain natural circulation at hot standby conditions for four (4) hours. The required heaters and their controls shall be connected to the emergency buses in a manner that will provide redundant power supply capability.*

Clarification (2)

- *The number of heaters required to have access to each emergency power source is that number required to maintain natural circulation conditions in the hot standby* condition *for four (4) hours.*

Clarification (4)

- *Any changeover of the heaters from normal offsite power to emergency onsite power is to be accomplished manually in the control room. Upon failure of B-train electrical power, changeover includes actions performed locally at 120 VAC panel Y02.*

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Proposed Changes To UFSAR

Entergy intends to submit a LAR to modify the UFSAR design for pressurizer heaters.

UFSAR Section 4.2.4.4 – Pressurizer Heaters

Each diesel generator emergency bus supplies emergency power to 168 kW of pressurizer heaters. Two separate sets of heaters totaling 84 kW each are supplied by the diesel generators. The remaining 84 kW is powered from a swing bus which can be supplied by either diesel generator. This ensures emergency power redundancy to sufficient heater capacity to establish and maintain pressure control at hot standby for 4 hours during a loss of offsite power. To meet the requirements of NUREG-0578, c*hangeover of the heaters from normal offsite power to emergency onsite power is generally accomplished manually in the control room. Upon failure of B-train electrical power, changeover includes actions performed locally at 120 VAC panel Y02.*

Technical Justification - Pressurizer Heater Capacity

- The NRC staff noted on page 2 of NUREG-0737, in part:
  - The staff will consider requests for relief from various aspects of these criteria. Such requests should explain the need for relief, include a clear description of design features of the proposed installation, and provide a safety rationale supporting the adequacy of the proposed installation.

- The heaters are not specifically used in accident analysis. The requirement to maintain subcooling during loss of offsite power is from NUREG-0578/0737.

- The current requirement for the pressurizer heaters are to maintain the Reactor Coolant System (RCS) in a subcooled condition with natural circulation for an unspecified period after a loss of offsite power.

Technical Justification - Pressurizer Heater Capacity

- In 1992, ANO-1 determined via calculation that minimum RCS subcooling margin would be maintained for 4.9 hours with the measured ambient heat loss.

- ANO-1 proposes to define a 4-hour requirement to maintain minimum subcooling margin via the use of pressurizer heaters during a Lost of Offsite Power (LOOP) event.

- The 4-hour duration is chosen to align with the requirements of the 10 CFR 50.63, “Loss of all alternating current power.”
  - For station blackout, ANO-1 has a 4-hour coping duration, as determined by RG 1.155 and NUMARC 87-00.

Defense-in-depth – Pressurizer Heater Capacity

- Abnormal Operating Procedures
- Emergency Operating Procedures
- Operator Training
- B&W documentation supports that High-Pressure Injection is an acceptable alternate method to control RCS pressure.

Technical Justification – Pressurizer Heater Power Supply

- Clarification (4) associated with TMI Action Item II.E.3.1 states "any changeover of the heaters from normal offsite power to emergency onsite power is to be accomplished manually from the control room.”
- Normal change over of the heaters to emergency power is unaffected and is accomplished from the control room.
- Current ANO-1 design:
  - The ANO-1 pressurizer Lo-Lo level interlock is powered by the B-train 120 VAC vital bus only.
  - The interlock must be powered to allow for pressurizer heater operation.
  - If the B-train 120 VAC vital bus is unable to be restored from its normal distribution system, the bus can be powered from the A-train 120 VAC vital bus.
  - This transfer of power occurs outside the control room.

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Technical Justification – Pressurizer Heater Power Supply

- Entergy intends to show the action is procedurally controlled, reflected in the training programs, completed within the time required, considers aggregate effects, and operators can recover from credible errors.

- Entergy submittal will contain:
  - Description of procedural controls
  - Operator training
  - Operator diagnosis
  - Description of the sequence of operator tasks, beginning with how the operators recognize the problem, required tools, environmental hazards, communication, durations, and ending when the pressurizer heaters are confirmed operable,
  - Relevant plant and electrical schematic drawings

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Precedent

Duane Arnold – LAR for reducing the ADS nitrogen requirement to less than originally specified in NUREG-0737

- Submittal – ML17248A284, Approval – ML18179A184

Waterford 3 – LAR to add manual operator action outside the control room.

- Submittal - ML13316C052, Approval - ML15139A483

ANO-2 – LAR to move the pressurizer heaters to the Technical Requirements Manual (TRM)

- Submittal - ML101170607, Withdrawal – ML101480896

Precedent

Indian Point 2 – Request to rescind portions of the TMI Action Plan. NRC response was to submit a LAR.

- Request Letter – ML010740093, NRC Response – ML011780246

Crystal River 3 – Request for one-time alternate compliance with portions of NUREG-0578/0737. Relief request was approved.

- Request Letter – ML003735234, Approval – ML003748468

Catawba – Request to revise NUREG-0737 requirements for hydrogen monitors. NRC response was to use 10 CFR 50.59 or 50.54q

- Request Letter – ML052570453, NRC Response - ML060730363

Timeline for Submittal

- Submittal to NRC – 1st quarter 2024
- Requesting 12 Month Approval

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CLOSING REMARKS