Southern Nuclear

Pre-Submittal Meeting

Plant Hatch LAR: Relaxation of Required Number of Fully Tensioned Reactor Pressure Vessel Head Closure Studs (TS Table 1.1-1 “MODES”)

DATE: August 1, 2022

Meeting Purpose

- Discuss proposed license amendment request (LAR) to revise TS Table 1.1-1, “MODES” to allow operation with the required reactor pressure vessel head closure studs fully tensioned.
- Address questions and feedback from the NRC staff.

Meeting Agenda

- LAR Summary Description
- Current Technical Specification Requirements
- Reason for Proposed Change
- Description of Proposed Change
- Technical Evaluation of Proposed Change
- Precedent
- Schedule

LAR Summary Description

- Revision to TS Table 1.1-1, “MODES,” to specify that the “required” vessel head closure studs be fully tensioned. The proposed change would allow one closure stud for HNP Unit 1 and two closure studs for HNP Unit 2 be less than fully tensioned during operation.
- SNC is proactively pursuing this LAR to prevent the possible need for an Exigent or Emergency LAR during the HNP Unit 2 Spring (February) 2023 Refueling Outage.

Current Technical Specification Requirements (both units)

Table 1.1-1 (page 1 of 1)
MODES

MODE	TITLE	REACTOR MODE SWITCH POSITION	AVERAGE REACTOR COOLANT TEMPERATURE (°F)
1	Power Operation	Run	NA
2	Startup	Refuel[(a)] or Startup/Hot Standby	NA
3	Hot Shutdown[(a)]	Shutdown	> 212
4	Cold Shutdown[(a)]	Shutdown	≤ 212
5	Refueling[(b)]	Shutdown or Refuel	NA

(a) All reactor vessel head closure bolts fully tensioned.

(b) One or more reactor vessel head closure bolts less than fully tensioned.

Reason for the Proposed Change

- Flaw indication found on HNP Unit 2 closure stud #33 in 2017 refueling outage (2R24). Indication is just below or at the surface of the reactor vessel flange.
- Removal of closure stud #33 is necessary to perform ASME Section V, Mandatory Appendix 6 (Liquid Penetrant) or Mandatory Appendix 7 (Magnetic Particle) Surface Examination.
- Attempts to remove closure stud #33 in refueling outages 2R24 and 2R25 have been unsuccessful.
- Closure stud #33 remains in place and is approved in a Code Relief (ML19035A550) to remain for the duration of the current 5th ISI Interval which is scheduled to end on December 31, 2025. Closure stud #33 is fully tensioned at this time.

Reason for the Proposed Change

- If the indication on closure stud #33 becomes worse, or indication is found on another stud, there is the possibility that a stud(s) might be incapable of full tension.
- In addition, SNC plans to make additional, more aggressive attempts to remove and replace stud #33 during the HNP Unit 2 Spring 2023 Refueling Outage (2R27).
- SNC is proposing changes to TS Table 1.1-1 to address the increased possibility that a closure stud may not be able to be fully tensioned.
- HNP Unit 1 is included in the LAR for contingency and preemption of any possible future exigent or emergency LAR.

Description of Proposed Change (both units)

- Footnote (a) currently states:

  (a) All reactor vessel head closure bolts fully tensioned.

  The proposed change would revise the footnote to state:

  *(a) All **required** reactor vessel head closure bolts fully tensioned.*

- Footnote (b) currently states:

  (b) One or more reactor vessel head closure bolts less than fully tensioned.

  The proposed change would revise the footnote to state:

  *(b) One or more **required** reactor vessel head closure bolts less than fully tensioned.*

Description of Proposed Change

- Use of “required” is consistent with TSTF-GG-05-01, Rev. 1, “Writer’s Guide for Plant-Specific Improved Technical Specification”
  - Allows some of all possible components (e.g., head closure bolts) to be used to satisfy the requirement
- HNP Unit 1: “required” number of fully tensioned closure bolts is 51 of the 52 closure bolts based on Calculation C-037-2201-00-01, Rev. 0, “Hatch Unit 1 Operation with One Stud Out of Service Evaluation”
- HNP Unit 2: “required” number of fully tensioned closure bolts is 54 of the 56 closure bolts based on Calculation C-037-2201-00-02, Rev. 0, “Hatch Unit 2 Operation with Two Studs Out of Service Evaluation”

Technical Evaluation of Proposed Change

- Closure Stud Primary Stress
  - HNP Unit 1
    - The average stresses in the studs due to primary load conditions were calculated with all studs meeting the ASME code requirements for primary loads with one stud out of service.
    - The maximum primary stud stress is calculated to be 35.48 ksi, which is less than the S_m allowable of 36.3 ksi.
  - HNP Unit 2
    - The average stresses in the studs due to primary load conditions were calculated with all studs meeting the ASME code requirements for primary loads with two studs out of service.
    - The maximum primary stud stress is calculated to be 34.74 ksi, which is less than the S_m allowable of 36.3 ksi.

Technical Evaluation of Proposed Change

- Analysis of Closure Flange
  - The approach used to evaluate the effect of one stud out of service (HNP Unit 1) and two studs out of service (HNP Unit 2) on the ASME Code comparison stresses in the reactor vessel closure flange components is to:
    - determine the stresses in the studs and vessel for the intact case and for the case of a single stud out of service under preload plus design pressure conditions,
    - determine the increase in the stresses when going from the intact to single stud out of service condition (Unit 1), or two studs out of service (Unit 2),
    - add the calculated increase in stress to the stress given in the design report which includes the effect of plant design transients, and
    - compare the calculated single stud(s) out of service condition stresses to ASME Code requirements.

Technical Evaluation of Proposed Change

- Analysis of Closure Flange (continued)
  - HNP Unit 1 - operation of the reactor pressure vessel with one stud out of service does not result in any component of the RPV closure flange to exceed the design basis ASME Code allowables with margin.
  - HNP Unit 2 - operation of the reactor pressure vessel with two studs out of service, with a minimum of nine studs between them, does not result in any component of the RPV closure flange to exceed the design basis ASME Code allowables with margin.

Technical Evaluation of Proposed Change

- Pressure Considerations
  - Consistent with HNP2 Code Relief (ML19035A550) approved on February 6, 2019, supporting calculations assumed full design pressure of 1,250 psia.
  - A sensitivity case has been run for each unit assuming an emergency and faulted transient pressure of 1,375 psia. Conclusions from the sensitivity runs are:
    - The increase in pressure is lower than the increased allowables associated with the transient categories, thus there is no concern about stresses at these transients.
    - The HNP Unit 1 case (one stud out of service) maximum gap opening is 0.022 inch.
    - The HNP Unit 2 case (two studs out of service) maximum gap opening is 0.021 inch.
    - See additional discussion on next page.

Technical Evaluation of Proposed Change

- Consideration of Seal Leakage, Head Flexure (gap at out-of-service studs)
  - At full design pressure (1250 psia), amount of flexure and additional opening is less than 10 mils (0.010 inch).
  - The typical minimum value for the RPV closure o-ring springback is 0.010 to 0.015 inch. Additionally, there is the double o-ring as a backup. Therefore, there is no additional risk of leakage.
  - In regard to the sensitivity cases at higher pressure (1375 psia), maximum gap opening (Unit 1 - 0.022 inch, Unit 2 - 0.021 inch) is greater than typically quoted springback; however, this should not lead to leakage.
    - For reference, an evaluation of an actual case (2011) for a similar BWR was performed. That BWR experienced about 10 gpm of leakage at 940 psi operating pressure. The reference evaluation calculated an o-ring gap of about 0.065 to 0.075 inch.
    - TS 3.4.4, RCS Operational Leakage, applies.
    - Reference also HNP-1-FSAR Section 7.8.5.5, Reactor Vessel Top Head Flange Leak Detection, and HNP-2-FSAR Section 5.6.2.5, RPV Top Head Flange Leak Detection.

Precedent

- Exelon Braidwood and Byron Amendment Nos. 186 and 192, October 2015 (ADAMS Accession No. ML15232A441)
  - Approved the use of the methodology for developing the pressure and temperature limits reports and changes to TS Table 1.1-1, “MODES”
  - Approved revision to footnotes adds “required”
- Proposed LAR is not requesting changes to the pressure and temperature limits methodology
- Proposed LAR is based on the stresses resulting from two conditions which bound the effects of stud(s) out of service:
  (1) operating with stud(s) left untensioned, and
  (2) the unlikely condition of stud(s) that are tensioned then fail in service

Schedule

- SNC expects to submit the LAR on or about August 10, 2022.
- SNC requests approval of the LAR prior to completion of the HNP Unit 2 Spring 2023 Refueling Outage (RFO).
  - Approval on or about February 25, 2023.
  - SNC intends to attempt to remove the stuck stud in HNP Unit 2 during the RFO.
    - This LAR is proactive to negate the possible need for an Exigent or Emergency LAR during the RFO.

Questions?