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10 CFR 50.90

2CAN121801

December 19, 2018

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: License Amendment Request
Add Actions to Address Inoperability of the Containment Building Sump
Arkansas Nuclear One, Unit 2
Docket No. 50-368
License No. NPF-6

In accordance with the provisions of 10 CFR 50.90 of Title 10 of the Code of Federal Regulations (10 CFR), Entergy Operations, Inc. (Entergy), is submitting a request for an amendment to the technical specifications (TS) for Arkansas Nuclear One, Unit 2 (ANO-2).

The proposed amendment establishes Actions and Allowable Outage Times (AOTs) applicable to conditions where the ANO-2 containment building sump is inoperable. This sump supports long term recirculation of the Reactor Coolant System following a loss of coolant accident of sufficient magnitude. Two systems are supported by the sump's safety function: 1) the High Pressure Safety Injection system, and 2) the Containment Spray System. Currently, sump inoperability would render both trains of these two systems inoperable, even when inoperable solely due to identified containment accident generated and transported debris exceeding the analyzed limits for the sump.

The proposed changes are similar to those associated with Technical Specification Task Force (TSTF)-567-A, Revision 1, "Add Containment Sump TS to Address GSI-191 Issues" (Reference 1). In general, TSTF-567-A created a new technical specification (TS) addressing sump inoperability; however, this TSTF was only applicable to plants having a Safety Function Determination Program (SFDP) included in the TSs. The SFDP is only available to those plants which have TSs converted to the improved standard TSs (ISTS).

Nevertheless, Entergy proposes to add a new TS addressing containment sump inoperabilities consistent with that of TSTF-567. The proposed changes are intended to support Entergy's resolution of Generic Safety Issue (GSI)-191, "Assessment of Debris Accumulation on Pressurized-Water Reactor Sump Performance," for ANO-2. Note that the proposed changes, which are developed consistent with the changes made to the ISTS by TSTF-567, do not rely on the need for a SFDP. Furthermore, the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c).

The enclosure provides a description and assessment of the proposed changes. Attachment 1 of the enclosure provides the existing TS pages marked-up to show the proposed changes. Attachment 2 of the enclosure provides re-typed (revised) TS pages. Attachment 3 of the enclosure provides the existing TS Bases pages marked-up to reflect the proposed changes, for information only. There are no new regulatory commitments associated with this proposed change.

Approval of the proposed amendment is requested by January 1, 2020. Once approved, the amendment shall be implemented within 90 days.

No new regulatory commitments are included in this amendment request.

In accordance with 10 CFR 50.91, Entergy is notifying the State of Arkansas of this amendment request by transmitting a copy of this letter and enclosure to the designated State Official.

If there are any questions or if additional information is needed, please contact David Bice at 479-858-5338.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on December 19, 2018.

Sincerely,

**ORIGINAL SIGNED BY MANDY K. HALTER**

MKH/dbb

Enclosure: Evaluation of the Proposed Change

REFERENCE:

1. NRC Safety Evaluation dated July 3, 2018, *Final Safety Evaluations of Technical Specifications Task Force Traveler TSTF-567, Revision 1, "Add Containment Sump TS to Address GSI-191 Issues"* (EPID: L-2017-PMP-0005) (ML18116A606)

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**Enclosure to**

**2CAN121801**

**Evaluation of the Proposed Change**

# EVALUATION OF THE PROPOSED CHANGE

## 1.0 SUMMARY DESCRIPTION

The proposed amendment would modify Arkansas Nuclear One, Unit 2 (ANO-2) Renewed Operating License NPF-6 Technical Specifications (TSs) to include Actions and Allowable Outage Times (AOTs) applicable to conditions where the ANO-2 containment building sump is inoperable. The proposed changes are intended to support the station's response addressing Generic Safety Issue (GSI)-191 "Assessment of Debris Accumulation on Pressurized-Water Reactor Sump Performance."

The proposed changes are similar to those associated with Technical Specification Task Force (TSTF)-567-A, Revision 1, "Add Containment Sump TS to Address GSI-191 Issues" (Reference 1). In general, TSTF-567-A created a new TS addressing sump inoperability. However, this TSTF was only applicable to plants having a Safety Function Determination Program (SFDP) included in the TSs. The SFDP is only available to those plants which have TSs converted to the improved standard TSs (ISTS). Nevertheless, the absence of a SFDP does not impact the application of TSTF-567-A related changes within the ANO-2 TSs (discussed later).

The proposed amendment adds a new TS 3.6.4.1, "Containment Sump," and adds an Action to address the condition of the containment sump being declared inoperable due to containment accident generated and transported debris exceeding the analyzed limits. The Action provides time to correct or evaluate the condition in lieu of an immediate plant shutdown. This Action is placed in a new specification governing the containment sump that otherwise retains the existing TS requirements. An existing Surveillance Requirement (SR) 4.5.2.c is moved from TS 3.5.2, "ECCS Subsystems – $T_{avg} \geq 300$ °F," to the new specification and modified consistent with the changes contained in TSTF-567. Subsequently, TS 3.5.3, "ECCS Subsystems – $T_{avg} < 300$ °F," will no longer require performance of TS 3.5.2 SR 4.5.2.c.

## 2.0 DETAILED DESCRIPTION

### 2.1 System Design and Operation

The containment building sump supports long term recirculation of the Reactor Coolant System (RCS) following a loss of coolant accident (LOCA) of sufficient magnitude. Two systems are supported by the sump's safety function: 1) the High Pressure Safety Injection (HPSI) system, and 2) the Containment Spray System (CSS). During initial accident response, the HPSI and CSS receive suction from a common Refueling Water Tank (RWT). The HPSI system injects this borated water into the reactor core while the CSS provides water to the spray headers located near the ceiling of the containment building. Subsequently, the HPSI system acts to maintain core cooling while the CSS acts to reduce containment building pressure and temperature, and also aids in the retention of iodine in solution.

Water from the CSS and that exiting the break in the RCS collects in the containment building sump, located in the lowest elevation of the containment building. Once the RWT inventory is depleted, HPSI and CSS automatically shift to take suction from the containment building sump. The sump water is injected back into the RCS and supplied to the spray headers, which again drains back to the sump, where the cooling cycle repeats. This latter stage of accident response is referred to as the "long term recirculation" mode of core cooling. While the sump is

divided into two sections, one section supplying one train of the Emergency Core Cooling System (ECCS) and the other section supplying the redundant ECCS train, the two sections are in hydraulic communication with one another. This ensures water from either section can reach either ECCS train should a single failure of an ECCS train occur at the onset of a design basis accident (DBA).

The containment building floor acts as a large collecting reservoir for the sump. The sump is designed to provide an adequate supply of water with a minimum amount of particulate matter to the HPSI and CSS. An arrangement consisting of a series of strainer modules and a sump plenum that completely covers the sump is provided to prevent debris generated in a large break LOCA event from entering the sump which could degrade HPSI and CSS pump performance. There are eight strainer modules connected to the west side of the plenum and fourteen modules connected to the east side of the plenum. The strainer modules are constructed from perforated plates.

The plenum lower structural support channel is anchored to the containment floor and sealed with non-structural grout to prevent the entry of small, high density particles from entering the sump. The plenum has one small, screened opening at the containment floor level, on the east and west side of the plenum, to allow leakage to drain into the sump. These two openings are provided with a fine mesh inner screen and a larger mesh outer screen which acts as an impingement barrier to protect the inner screen. The sump contains two box screens at the discharge of the floor drain lines that enter the sump. These box screens also utilize a fine mesh and large mesh screen. Given these design features, any debris passing through the sump will be of small enough dimension to also pass through any restriction in either the HPSI or CSS.

Additional information related to the containment building sump can be found in various sections of the ANO-2 Safety Analysis Report (SAR), including Sections 3.4.4.2.1 and 6.2.2.2.B.7.

## 2.2 Current TS Requirements

Currently, sump inoperability would render both trains of HPSI and CSS inoperable, even when the sump is inoperable solely due to identified containment accident generated and transported debris exceeding the analyzed limits for the sump. While ANO-2 TS 3.5.2 contains a SR intended to ensure the sump remains clear of debris, no corresponding TS Action exists if this SR were not met. With the sump inoperable (rendering both HPSI and CSS trains inoperable), restoration would be required within one hour or a unit shutdown to Mode 3 would be required within the next six hours (assuming the plant is operating in Modes 1 or 2), followed by an RCS cooldown to < 1700 psia within the next 6 hours and transition to Mode 5 within the following 20 hours. The absence of a sufficient AOT to restore or evaluate the condition of the sump can, therefore, lead to plant shutdown without a commensurate benefit to nuclear and public safety.

## 2.3 Reason for the Proposed Change

Entergy has analyzed the susceptibility of the ANO-2 ECCS and CSS to the adverse effects of post-accident debris blockage and operation with debris-laden fluids. Entergy has established appropriate limits on the allowable quantities of containment accident generated debris that could be transported to the containment sump based on the ANO-2 plant configuration.

If unanalyzed debris sources are discovered inside containment, if errors are discovered in debris-related analyses, or if a previously unevaluated phenomenon that can affect containment sump performance is discovered, the containment sump, and the supported ECCS and CSS, may be inoperable. In this case, the TSs require an immediate plant shutdown and no time is provided to evaluate the condition.

The proposed changes, in part, aid in addressing GSI-191 issues (discussed in detail in Section 3.0 below). The new Actions and AOTs are intended to provide time to correct or evaluate the condition of the containment building sump in lieu of a prompt shutdown of the plant, when the condition involves identified containment accident generated and transported debris exceeding the analyzed limits for the sump.

2.4 Description of the Proposed Change

ANO-2 is a non-ISTS plant, having TSs modeled after the Combustion Engineering (CE) standard TS of NUREG 0336. Therefore, the ANO-2 TSs utilize different numbering and titles than the ISTS. The differences are described below, with specific reference to changes associated with TSTF-567, where applicable. These differences are editorial and do not affect the bases and intent of TSTF-567, where applicable, to ANO-2.

Consistent with TSTF-567, ANO-2 TS SR 4.5.2.d (ISTS SR 3.5.2.10) is moved to a new containment sump TS 3.6.4.1 (ISTS 3.6.13) and modified in accordance with TSTF-567. The current SR 4.5.2.d wording is included below, with modifications shown in a marked-up fashion:

> At least once per 18 months verify, by a visual inspection, ~~of~~ the containment sump does not show~~and verifying that the subsystem suction inlets are not restricted by debris and that the sump components (trash racks, screens, etc.) show no evidence of~~ structural damage~~distress~~, ~~or~~abnormal corrosion, or debris blockage.

SR 4.5.2.c is also removed from ANO-2 TS 3.5.2. This deletion was not part of the TSTF-567 markups since this SR does not exist in the ISTS:

> By a visual inspection which verifies that no loose debris (rags, trash, clothing, etc.) is present in the containment which could be transported to the containment sump and cause restriction of the pump suctions during LOCA conditions. This visual inspection shall be performed:
>
> 1. For all accessible areas of the containment prior to establishing CONTAINMENT INTEGRITY, and
>
> 2. At least once daily of the areas affected within containment if containment has been entered that day, and during the final entry when CONTAINMENT INTEGRITY is established.

SR 4.5.2.c is an administrative control associated with the ANO foreign material exclusion program and with closeout of the containment building following any personnel access to the building. The justification for deletion of this SR is included in Section 3.0 below.

Formatting of the subject TS page (3/4 5-4) was slightly revised to provide a more professional layout of the material. No letters, words, or punctuation was modified while revising formats. Because format changes involve no technical changes, this amendment request contains no further discussion of formatting adjustments.

Note that TS Page 3/4 5-4 is currently under review by the NRC in association with ANO-2's proposed application of risk-informed justification for the relocation of specific surveillance frequency requirements to a licensee controlled program (TSTF-425) (Reference 2). The markup and clean version of this TS page included in this submittal does not include changes proposed under the ANO-2 TSTF-425 application.

ISTS 3.5.3, "ECCS – Shutdown," references ISTS 3.5.2, "ECCS – Operating," SRs by numbers. Because of this, TSTF-567 deleted the ISTS 3.5.3 reference to ISTS SR 3.5.2.10, which was relocated to the new ISTS 3.6.13 containment sump specification as described above. ANO-2 TS 3.5.3 generically refers to all ANO-2 TS 3.5.2 SRs. Therefore, no changes associated with ANO-2 TS 3.5.3 are required to maintain consistency with the intent of TSTF-567.

Consistent with TSTF-567, a new containment sump TS is proposed for ANO-2 (TS 3.6.4.1). The wording of the new ANO-2 TS is consistent with the intent of TSTF-567, although the old standard formatting of the ANO-2 TSs is retained. As stated previously, the titles and numbering of the ANO-2 specifications referenced in the new TS 3.6.4.1 match the current titles of ANO-2 TSs 3.5.2 and 3.5.3 (described in Section 1.0 above), and TS 3.6.2.1, "Containment Spray System." These titles differ from those of the ISTS (also described above). In addition, ISTS containment sump specification 3.6.13, Required Action A.2 references ISTS SR 3.4.13.1 for performance of an RCS inventory balance. The similar ANO-2 SR is SR 4.4.6.2.1.a and is included in new ANO-2 TS 3.6.4.1, Action a.2.

Because ANO-2 is a non-ISTS plant and does not have a SFDP, the aforementioned new actions addressing conditions when the containment sump is inoperable solely due to containment accident generated and transported debris exceeding the analyzed limits are modified by a statement that permits the respective ECCS and CSS Limiting Conditions for Operation (LCOs) to <u>not</u> be entered when the containment sump is inoperable solely due to containment accident generated and transported debris exceeding the analyzed limits (emphasis added):

> With the containment sump inoperable due to containment accident generated and transported debris exceeding the analyzed limits, <u>LCO 3.5.2, "ECCS Subsystems – $T_{avg}$ ≥ 300 °F," LCO 3.5.3, "ECCS Subsystems – $T_{avg}$ < 300 °F," and LCO 3.6.2.1, "Containment Spray System," may be considered met</u> provided:

This added statement is similar to and meets the intent of the changes made to the SFDP under TSTF-567. In the absence of this statement, the proposed 90-day AOT of the new containment sump TS would be irrelevant, since entry into the ECCS and CSS LCOs would be required.

The ANO-2 TS Bases do not contain the detail of the ISTS Bases and, therefore, no Bases-related changes are required in relation to the changes proposed for ANO-2 TSs 3.5.2 and 3.5.3. However, the ISTS Bases associated with the new containment sump TS is adopted, consistent with the Bases wording contained in TSTF-567.

Attachment 1 of this enclosure provides the existing ANO-2 TS pages marked-up to show the proposed changes. Attachment 2 of this enclosure provides re-typed (revised) TS pages. Attachment 3 of this enclosure provides a mark-up of TS Bases pages, for information only. Changes to the TS Bases are controlled and performed in accordance with ANO-2 TS 6.5.14, "Technical Specification (TS) Bases Control Program," and the requirements of 10 CFR 50.59.

## 3.0 TECHNICAL EVALUATION

The greatest potential source of debris in the containment building is insulation. Fiberglass blanket and all-metal stainless steel reflective insulation is used on the reactor coolant pressure boundary piping and vessels. Calcium silicate insulation, which is covered with stainless steel jacketing, is used to insulate other hot piping within the Steam Generator (SG) cavities in the containment building. Stainless steel jacketed cellular glass insulation is used on chiller piping outside the SG cavities to prevent condensation, e.g., chilled water piping to the Control Element Drive Mechanism cooling units.

Insulation is permanently attached to piping and vessels except at welds where it is removable for inservice inspection, as required. Special fasteners are used to secure removable panels. A postulated high energy pipe rupture could break loose removable panels. Guillotine or slot breaks could blow or whip loose permanently installed panels. Insulation falling into the reactor vessel cavity would be of minimal consequence. Strainers are provided over the refueling canal drains to prevent clogging in the unlikely event that any large object fell into the canal. The strainer modules are mounted on floor supports that raise the strainer inlets approximately eight inches above the containment floor. It is unlikely that insulation panels which have fallen to the floor of the containment would be washed into the strainer modules. The containment sump was evaluated in accordance with GSI-191 criteria to determine effects on the available net positive suction head (NPSH) to the HPSI and CSS pumps, strainer structural design, and other limitations on strainer head loss. In response to GSI-191 and Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors," additional strainer surface area has been added to the sump. The following provides a summary description of the ANO-2 analysis of DBA debris impacts on the containment sump and, subsequently, the supported ECCS components:

- Debris quantities generated by a LOCA are determined by analysis that establishes the distance from a break at which various insulation, coatings, and other detrimental materials are released. A limiting break is determined from this analysis based on the debris mixture that produces the most detrimental strainer head loss.

- Chemical effects associated with the precipitation of aluminum compounds are evaluated for their impact on sump strainer head loss and reactor fuel assemblies.

- Strainer head loss due to debris and chemical precipitates was determined via scaled testing of strainer modules. The head loss test results were compared against available NPSH margin or strainer structural limits for acceptability.

- The NPSH margin for the HPSI and CSS pumps were revised to include available margins as sump temperatures become sub-cooled. This allows determination of the sump water temperature range at which NPSH becomes less limiting to strainer allowable head loss than the 6.1 feet containment sump strainer structural limitation.

- Downstream effects are evaluated for components in the sump recirculation flow path to ensure the debris generated by a LOCA that can pass through the strainer's 0.0625-inch openings will not result in blockage or unacceptable wear.

- The reactor vessel internals, including fuel assemblies, are evaluated for potential detrimental effects from the debris generated by a LOCA that can pass through the strainer.

In summary, the ANO-2 containment building sump analysis during post-accident conditions complies with the requirements of GL 2004-02 for addressing GSI 191. In addition, Entergy has completed the large-scale containment sump bypass testing required for ANO-2. An NRC commitment (final update of related calculations and licensing basis) is described in Entergy letter dated November 20, 2017 (Reference 3), to be completed following NRC approval of WCAP-17788, "Comprehensive Analysis and Test Program for GSI-191 Closure."

The containment sump supports the post-accident operation of the ECCS and CSS, but only the current ECCS TS contains SRs on the containment sump. There are no TS Actions specifically applicable to an inoperable containment sump in the ECCS or CSS TS. To address this inconsistency, the proposed change creates a new specification on the containment sump which treats the containment sump as a TS support system, similar to the treatment of the TS 3.5.4 ECCS and CSS water source referred to as the RWT (ISTS and ANO-2 TSs).

The proposed change provides an Action which is applicable when containment accident generated and transported debris exceeds the analyzed limits. In the current TS, this condition would result in declaring the supported ECCS and CSS trains inoperable which can result in a plant shutdown similar to the time requirements of LCO 3.0.3. This does not provide time to evaluate or correct the condition. Providing time to evaluate or correct the condition is appropriate because of the small likelihood of an accident requiring recirculation from the containment sump during the proposed AOT, the margins in the debris generation and transport analyses and in the downstream and in-vessel effects analyses, and the mitigating actions required by the proposed TS.

*ANO-2 SR 4.5.2.d*

As described in Section 2.4 above, ANO-2 SR 4.5.2.d is modified and moved to a new TS 3.6.4.1 which governs the operability of the containment sump. The containment sump consists of the containment drainage flow paths, any design features upstream of the containment sump that are credited in the containment debris analysis, the containment sump strainers (or screens), and the inlet to the ECCS and CSS piping. The new SR 4.6.4.1.1 does not limit the visual inspection to specific structures such as the suction inlet and screens as currently required by the ANO-2 TSs and the ISTS, but instead requires inspection of the entire containment sump system.

10 CFR 50.36(c)(3) requires TSs to include SRs, which are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the LCOs will be met. The proposed change is acceptable since the existing requirements are either unchanged or expanded and continue to ensure the containment sump is unrestricted (i.e., unobstructed) and remains in proper operating condition. The proposed change meets the requirements of

10 CFR 50.36(c)(3) because it provides an SR to assure the necessary quality of systems and components are maintained, that facility operation will be within safety limits, and that the LCOs will be met.

*ANO-2 SR 4.5.2.c*

As discussed in Section 2.4 above, ANO-2 SR 4.5.2.c is an administrative control associated with the ANO foreign material exclusion (FME) program and with closeout of the containment building following any personnel access to the building. This SR existed in the original version of the ANO-2 TSs and was not addressed in TSTF-567 because it does not exist in the ISTS.

FME procedures provide instruction to prevent foreign material from becoming a concern for or entering a structure, system, or component (SSC), and also provide instruction for inspections of SSCs prior to returning the SSC to service. In addition, ANO procedure OP-2102.001, "Pre-Heatup and Pre-Critical Checklist," directs entry into OP-1015.036, "Containment Building Closeout" prior to entry into Mode 4 from Mode 5 (containment integrity is required in Modes 1 through 4), and prior to entry into Mode 2 (startup) from Mode 3. OP-1015.036 requires inspection of containment drains, the containment sump, and the general areas of the containment building to ensure that any trash, debris, or foreign materials present in the containment building are within analyzed limits such that the containment sump will provide an adequate suction source for ECCS pumps in the event of a DBA. The drain inspection also ensures that small RCS leaks are detected quickly, which supports the ANO-2 Leak-Before-Break Analysis. Equipment inspections ensure that items remaining in the containment building have been evaluated by engineering and are properly secured. Once the closeout of the containment building is completed, OP-1015.036 refers to OPG-007, "Containment Building Entry Checklist (Modes 1-4)," which in conjunction with OP-1015.016M, "Unit 2 Containment Building Inspection," ensures the containment building remains free of foreign material upon further personnel access into the containment building.

FME controls are generally associated with maintenance and inspection activities. As with all such activities, it is incumbent upon the licensee to ensure any SSC is properly restored and configured prior to return to service. This not only includes ensuring foreign material has not been introduced into an SSC, but also requires other basic verifications such as proper oil levels in pumps, correct system alignments (cooling water, primary flow paths, etc.), proper venting and filling of systems, and post-maintenance testing where appropriate. These licensee responsibilities are not generically included in the TSs. ANO-2 SR 4.5.2.c is an FME control that verifies the status of the containment building prior to establishing containment integrity as required by the TSs. As discussed above, ANO FME controls also perform a second inspection of the containment building cleanliness prior to the approach to criticality and controls are also established for any containment building entry following the establishment of containment integrity.

In addition to the aforementioned controls, the LCO Bases for the new containment sump TS 3.6.4.1 states (emphasis added):

> An OPERABLE containment sump has no structural damage or abnormal corrosion that could prevent recirculation of coolant and <u>will not be restricted by containment accident generated and transported debris</u>.

Verification that potential debris in the containment building is, by default, required for the containment sump to be considered operable. The containment sump cannot be operable if the amount of potential debris would exceed the limits established by the plant-specific containment building sump analysis. SR 4.5.2.c is a foreign material control requirement which does not exist in the ISTS. In addition, foreign material controls are not generically specified in the TSs for other SSCs. Because the containment sump operability is assured by compliance with new TS 3.6.4.1 in conjunction with new SR 4.6.4.1.1, it is not necessary to retain SR 4.5.2.c within the TSs.

*New TS 3.6.4.1*

In order to address concerns related to containment sump operability due to debris accumulation described in GSI-191, Entergy proposes to add a new specification in the ANO-2 TSs to address containment sump inoperability and create a condition for when the sump is inoperable due to analyzed containment accident generated and transported debris.

The new specification satisfies the requirements of 10 CFR 50.36(c)(2)(i) (see Section 4.1 below) because the LCO specifies the lowest functional capability or performance levels of equipment required for safe operation of the facility. The new LCO states, "The containment sump shall be OPERABLE." The LCO Bases describe the system and explain how the TS Section 1.0 definition of operability applies to the LCO.

The containment sump supports the post-accident operation of the ECCS and CSS. The containment sump consists of the containment drainage flow paths, any design features upstream of the containment sump that are credited in the containment debris analysis, the containment sump strainers, and the inlet to the ECCS and CSS piping. The LCO Bases, as adopted for ANO-2, do not include a description of all design features credited in the containment debris analysis since such information would be redundant to the information contained in the ANO-2 SAR, Section 6.2.2.2.B.7. The LCO Bases, as adopted for ANO-2, differs from that contained in TSTF-567 in that ANO-2 TS wording is used in lieu of ISTS wording and some information is modified to match the actual operation of ANO-2 SSCs. An OPERABLE containment sump has no structural damage or abnormal corrosion that could prevent recirculation of coolant and will not be restricted by accident generated and transported debris. The LCO Bases contains information which summarizes what constitutes containment accident generated and transported debris and also references the applicable ANO-2 SAR which contains additional information.

The specification is Applicable in Modes 1, 2, 3, and 4. This is consistent with the most restrictive Applicability of the supported ECCS specifications (CSS is only required to be operable in Modes 1, 2, and 3).

Action a.1, a.2, and a.3 are applicable when the containment sump is inoperable due to containment accident generated and transported debris exceeding the analyzed limits.

The ISTS includes a SFDP that, under certain circumstances, permits the delayed entry into the Actions of supported TS SSCs when a respective support SSC (contained in the TSs) is inoperable. Because ANO-2 is a non-ISTS plant and does not have a SFDP, the aforementioned ANO-2 actions are modified by a statement that permits the respective ECCS and CSS LCOs to not be entered when the containment sump is inoperable solely due to containment accident generated and transported debris exceeding the analyzed limits. This

added statement is similar to and meets the intent of the changes made to the SFDP under TSTF-567. In the absence of this statement, the proposed 90-day AOT of the new containment sump TS would be irrelevant, since entry into the ECCS and CSS LCOs would be required.

While the SFPD requires LCO entry, but delays initiating the Actions of the respective LCO, the subject ANO-2 wording does not require LCO entry. This is because LCO entry without performance of the subject Actions is an administrative exercise only and does not enhance nuclear, personnel, or public safety. In addition, if any of the Actions contained in the new containment sump TS are not met, the new specification requires the plant to be shutdown (described below). Therefore, this administrative requirement of the SFPD is not incorporated in the proposed new ANO-2 containment sump TS.

Entergy has established limits for ANO-2 on the allowable quantities of containment accident generated debris that could be transported to the containment sump based on its current plant configuration. In the current TSs, if unanalyzed debris sources are discovered inside containment, if errors are discovered in debris-related analyses, or if a previously unevaluated phenomenon that can affect containment sump performance is discovered, the containment sump, and the supported ECCS and CSS, may be inoperable and the TSs would require a plant shutdown with no time provided to evaluate the condition.

In order to provide sufficient time to evaluate the condition, a new Action a.1 is proposed which requires immediate action to mitigate containment accident generated and transported debris in excess of the analyzed limits. Section 1.3, "Completion Times," of the ISTS defines an immediate Completion Time (AOT) as "the Required Action should be pursued without delay and in a controlled manner." This same concept is used by Entergy when applying “immediate” AOTs at ANO-2. The TS Bases provide examples of mitigating actions, such as:

- Removing the debris source from containment or preventing the debris from being transported to the containment sump;
- Evaluating the debris source against the assumptions in the analysis;
- Deferring maintenance that would affect availability of the affected systems and other LOCA mitigating equipment;
- Deferring maintenance that would affect availability of primary defense-in-depth systems, such as containment coolers;
- Briefing operators on LOCA debris management actions; or
- Applying an alternative method to establish new limits.

Action a.2 requires performance of the RCS water inventory balance, SR 4.4.6.2.1.a, at an increased Frequency of once per 24 hours instead of the usual Frequency of 72 hours. An unexpected increase in RCS leakage could be indicative of an increased potential for an RCS pipe break, which could result in debris being generated and transported to the containment sump. The more frequent monitoring allows operators to act in a timely fashion to minimize an RCS pipe break while the containment sump is inoperable.

Action a.3 requires the containment sump to be restored to operable status within 90 days. A 90-day AOT is reasonable for emergent conditions that involve debris in excess of the analyzed limits that could be generated and transported to the containment sump under accident conditions. The likelihood of an initiating event in the 90-day AOT is very small (25% of the LOCA annual frequency as generically derived and discussed in TSTF-567).

Entergy considers the proposed actions described above to be acceptable because the actions provide a reasonable amount of time to diagnose, plan and possibly reduce the severity of, or mitigate the unanalyzed debris condition and prevent a loss of ECCS and CSS safety function. In addition, 90 days is adequate given the conservatisms in the containment debris analysis and the proposed compensatory actions required to be implemented immediately by Action a.1. Also, as discussed later in this attachment, the new SR being proposed will require visual inspection of the containment sump system (including the containment drainage flow paths, any design features upstream of the containment sump that are credited in the containment debris analysis, the containment sump strainers, and the inlet to the ECCS and CSS piping for evidence of structural degradation, potential for debris bypass, and presence of corrosion or debris blockage) to ensure no loose debris is present and there is no evidence of structural distress or abnormal corrosion.

Actions b.1, b.2, and b.3 are applicable when the containment sump is inoperable for reasons other than conditions such as blockage, structural damage, or abnormal corrosion that could prevent recirculation of coolant. Action b.1 requires that the applicable actions of LCO 3.5.2, "ECCS Subsystems – $T_{avg} \geq 300$ °F," and LCO 3.5.3, "ECCS Subsystems – $T_{avg} < 300$ °F," be entered if an inoperable containment sump results in an inoperable ECCS train. In addition, Action b.2 requires that the applicable actions of LCO 3.6.2.1, "Containment Spray System," be entered if an inoperable containment sump results in an inoperable CSS train.

The 72-hour AOT of Action b.3 is consistent with the most limiting ECCS or CSS AOT for a single inoperable train. The AOT for both an inoperable ECCS train and/or CSS train is 72 hours (TS 3.5.2 and TS 3.6.2.1). Entergy considers the proposed actions to be acceptable since remedial actions continue to be provided for scenarios when the containment sump is inoperable for reasons other than conditions such as blockage, structural damage, or abnormal corrosion that could prevent recirculation of coolant, thereby ensuring the safe operation of the plant. In addition, the proposed 72-hour AOT is acceptable since it provides a reasonable time for repairs, and there is a low probability of an accident occurring during this period that would require the use of the containment sump.

If the associated AOTs of Actions a.1, a.2, a.3, b.1, b.2, and/or b.3 are not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 (Hot Standby) within 6 hours and to MODE 5 (Cold Shutdown) within the following 30 hours. The AOTs are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

Entergy considers this requirement to be acceptable because it is consistent with the ISTS and TSTF-567, and the action requires the Operators to place the unit in a condition in which the LCO no longer applies. In addition, the proposed AOTs associated with plant shutdown and cooldown allow a reasonable amount of time to decrease from full power conditions to the required plant conditions in an orderly manner and without challenging plant systems.

ANO-2 SR 4.5.2.d is moved from TS 3.5.2 and reworded to be more generic. The TS 3.5.2 SR was specific to ECCS train containment sump suction. The proposed SR is expanded to include the entire containment sump system, as defined in the TS LCO. The proposed SR requires verification, by visual inspection, that the containment sump does not show structural damage, abnormal corrosion, or debris blockage. The Frequency is maintained at the current SR frequency, which is currently 18 months. Because ANO-2 has applied for adoption of TSTF-425, the current 18-month frequency may require updating to "in accordance with the Surveillance Frequency Control Program" should TSTF-425 be approved prior to final resolution of this TSTF-567 related amendment request.

This periodic inspection includes the containment drainage flow paths, any design features upstream of the containment sump that are credited in the containment debris analysis, the containment sump strainers, and the inlet to the ECCS and CSS piping for evidence of structural degradation, potential for debris bypass, and presence of corrosion or debris blockage. Inspection of the containment sump is typically conducted late in a refueling outage to ensure the absence of debris generated by construction or maintenance activities.

Entergy considers the new SR to be acceptable since it expands the scope of inspection of the original SR and the established Frequency is the same as that of the previous SR as currently prescribed in the ISTS. Therefore, Entergy believes the new SR satisfies 10 CFR 50.36(c)(3), in that the necessary quality of systems will be maintained in accordance with the associated LCOs.

## 4.0 REGULATORY EVALUATION

### 4.1 Applicable Regulatory Requirements/Criteria

The following NRC requirements and guidance documents are applicable to the proposed change.

10 CFR 50, Appendix A, General Design Criterion (GDC) 4, "Environmental and Dynamic Effects Design Bases," states:

> Structures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents.

GDC 35, "Emergency Core Cooling," states:

> A system to provide abundant emergency core cooling shall be provided. The system safety function shall be to transfer heat from the reactor core following any loss of reactor coolant at a rate such that (1) fuel and clad damage that could interfere with continued effective core cooling is prevented and (2) clad metal-water reaction is limited to negligible amounts.

GDC 38, "Containment Heat Removal," states:

> A system to remove heat from the reactor containment shall be provided. The system safety function shall be to reduce rapidly, consistent with the functioning of other associated systems, the containment pressure and temperature following any loss-of-coolant accident and maintain them at acceptably low levels.

GDC 41, "Containment Atmospheric Cleanup," states:

> Systems to control fission products, hydrogen, oxygen, and other substances which may be released into the reactor containment shall be provided as necessary to reduce, consistent with the functioning of other associated systems, the concentration and quality of fission products released to the environment following postulated accidents, and to control the concentration of hydrogen or oxygen and other substances in the containment atmosphere following postulated accidents to assure that containment integrity is maintained.

GDC 36, "Inspection of Emergency Core Cooling," states:

> The emergency core cooling system shall be designed to permit appropriate periodic inspection of important components, such as spray rings in the reactor pressure vessel, water injection nozzles, and piping, to assure the integrity and capability of the system.

GDC 39, "Inspection of Containment Heat Removal," states:

> The containment heat removal system shall be designed to permit appropriate periodic inspection of important components, such as the torus, sumps, spray nozzles, and piping to assure the integrity and capability of the system.

GDC 42, "Inspection of Containment Atmospheric Cleanup," states:

> The containment atmosphere cleanup systems shall be designed to permit appropriate periodic inspection of important components, such as filter frames, ducts, and piping to assure the integrity and capability of the systems.

10 CFR 50.46(b)(5), "Long-term cooling," states:

> After any calculated successful initial operation of the ECCS, the calculated core temperature shall be maintained at an acceptably low value and decay heat shall be removed for the extended period of time required by the long-lived radioactivity remaining in the core.

Regulatory Guide (RG) 1.82, "Water Sources for Long-term Recirculation Cooling Following a Loss-of-Coolant Accident," describes methods that the NRC considers acceptable for use in implementing requirements regarding pressurized water reactor containment sumps that provide water sources for emergency core cooling, containment heat removal, or containment atmosphere cleanup systems. It also provides guidelines for evaluating the adequacy and the availability of the containment sump for long-term recirculation cooling following a LOCA.

The proposed change does not alter the design of ANO-2. As a result, the applicability of the GDC and the RG is not affected.

Section IV, "The Commission Policy," of the "Final Policy Statement on Technical Specifications Improvements for Nuclear Power Reactors," published in the *Federal Register* on July 22, 1993 (58 FR 39132), states, in part:

> The purpose of Technical Specifications is to impose those conditions or limitations upon reactor operation necessary to obviate the possibility of an abnormal situation or event giving rise to an immediate threat to the public health and safety by identifying those features that are of controlling importance to safety and establishing on them certain conditions of operation which cannot be changed without prior Commission approval.
>
> …[T]he Commission will also entertain requests to adopt portions of the improved STS [(e.g., TSTF-567)], even if the licensee does not adopt all STS improvements. …The Commission encourages all licensees who submit Technical Specification related submittals based on this Policy Statement to emphasize human factors principles.
>
> …In accordance with this Policy Statement, improved STS have been developed and will be maintained for each NSSS [nuclear steam supply system] owners group. The Commission encourages licensees to use the improved STS as the basis for plant-specific Technical Specifications. …[I]t is the Commission intent that the wording and Bases of the improved STS be used…to the extent practicable.

Entergy has developed the proposed changes consistent with the ISTS.

10 CFR 50.36(b) "Technical Specifications," states that Technical Specifications shall be derived from the analyses and evaluation included in the safety analysis report.
10 CFR 50.36(C)(2)(i) states that the TSs will include LCOs, which are the lowest functional capability or performance levels of equipment required for safe operation of the facility and that when an LCO is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the TSs until the condition can be met. The proposed change provides an LCO and remedial actions to be followed if the LCO is not met. Therefore, the proposed change is consistent with the requirements of 10 CFR 50.36.

10 CFR 50.36(c)(3) requires TSs to include SRs, which are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the LCOs will be met. The proposed change provides an appropriate SR that meets this regulatory requirement.

10 CFR 50.36(a)(1) states, in part: "A summary statement of the bases or reasons for such specifications, other than those covering administrative controls, shall also be included in the application, but shall not become part of the technical specifications." TS bases associated with the new containment sump TS has been developed, consistent with that provided in TSTF-567.

The proposed change does not affect compliance with the regulations or regulatory guidance, is consistent with the ISTF, and will ensure that the lowest functional capabilities or performance levels of equipment required for safe operation are met.

4.2 Precedent

TSTF-567 has not yet been approved for any U.S. commercial nuclear power plant at this time.

4.3 No Significant Hazards Consideration Analysis

The proposed amendment adds a new Technical Specification (TS) 3.6.4.1, "Containment Sump," and adds an Action to address the condition of the containment sump made inoperable due to containment accident generated and transported debris exceeding the analyzed limits. The Action provides time to correct or evaluate the condition in lieu of an immediate plant shutdown. This Action is placed in a new specification on the containment sump that otherwise retains the existing TS requirements. An existing Surveillance Requirement (SR) is moved from TS 3.5.2 to the new specification.

Entergy Operations, Inc. (Entergy) has evaluated whether a significant hazards consideration is involved with the proposed change by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No

   The proposed change adds a new specification to the TS for the containment sump. An existing SR on the containment sump is moved to the new specification. The new specification retains the existing requirements on the containment sump and the actions to be taken when the containment sump is inoperable with the exception of adding new actions to be taken when the containment sump is inoperable due to containment accident generated and transported debris exceeding the analyzed limits. The new action provides time to evaluate and correct the condition instead of requiring an immediate plant shutdown.

   The containment sump is not an initiator of any accident previously evaluated. The containment sump is a passive component and the proposed change does not increase the likelihood of the malfunction. As a result, the probability of an accident is unaffected by the proposed change.

   The containment sump is used to mitigate accidents previously evaluated by providing a borated water source for the Emergency Core Cooling System and Containment Spray System. The design of the containment sump and the capability of the containment sump assumed in the accident analysis are not changed. The proposed action requires implementation of mitigating actions while the containment sump is inoperable and more frequent monitoring of reactor coolant leakage to detect any increased potential for an accident that would require the containment sump. The consequences of an accident during the proposed action are no different than the current consequences of an accident if the containment sump is inoperable.

   Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No

   The proposed change adds a new specification to the TS for the containment sump. An existing SR on the containment sump is moved to the new specification. The new specification retains the existing requirements on the containment sump and the actions to be taken when the containment sump is inoperable with the exception of adding new actions to be taken when the containment sump is inoperable due to containment accident generated and transported debris exceeding the analyzed limits. The new action provides time to evaluate and correct the condition instead of requiring an immediate plant shutdown.

   The proposed change does not alter the design or design function of the containment sump or the plant. No new systems are installed or removed as part of the proposed change. The containment sump is a passive component and cannot initiate a malfunction or accident. No new credible accident is created that is not encompassed by the existing accident analyses that assume the function of the containment sump.

   Therefore, the proposed change does not create the possibility of a new or different kind of accident from an accident previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

   Response: No

   The proposed change adds a new specification to the TS for the containment sump. An existing SR on the containment sump is moved to the new specification. The new specification retains the existing requirements on the containment sump and the actions to be taken when the containment sump is inoperable with the exception of adding new actions to be taken when the containment sump is inoperable due to containment accident generated and transported debris exceeding the analyzed limits. The new action provides time to evaluate and correct the condition instead of requiring an immediate plant shutdown.

   The proposed change does not affect the controlling values of parameters used to avoid exceeding regulatory or licensing limits. No Safety Limits are affected by the proposed change. The proposed change does not affect any assumptions in the accident analyses that demonstrate compliance with regulatory and licensing requirements.

   Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based upon the reasoning presented above, Entergy concludes that the requested change involves no significant hazards consideration, as set forth in 10 CFR 50.92(c), “Issuance of Amendment.”

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

## 5.0 ENVIRONMENTAL CONSIDERATION

The proposed change would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR Part 20, and would change an inspection or surveillance requirement. However, the proposed change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed change meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, in accordance with 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed change.

## 6.0 REFERENCES

1. NRC Safety Evaluation, *Final Safety Evaluations of Technical Specifications Task Force Traveler TSTF-567, Revision 1, "Add Containment Sump TS to Address GSI-191 Issues"* July 3, 2018 (EPID: L-2017-PMP-0005) (ML18116A606)

2. Entergy letter, *Application for Technical Specification Change Regarding Risk-Informed Justification for the Relocation of Specific Surveillance Frequency Requirements to a Licensee Controlled Program (TSTF-425)*, Arkansas Nuclear One, Unit 2, February 6, 2018 (2CAN021802) (ML18038B354)

3. Entergy letter, *Generic Letter 2004-02 Commitment Extension*, Arkansas Nuclear One, Units 1 and 2, November 20, 2017 (0CAN111701) (ML17325B078)

ATTACHMENTS

1. Proposed Technical Specification Changes (Markup)

2. Re-typed Technical Specification Pages

3. Proposed Technical Specification Bases Changes (Markup) (Information Only)

**Enclosure Attachment 1 to**

**2CAN121801**

**Proposed Technical Specification Changes (Mark-Up)**

4.5.2 Each ECCS subsystem shall be demonstrated OPERABLE:

a. In accordance with the Surveillance Frequency Control Program by verifying that the following valves are in the indicated positions with power to the 2CV-5101-1 and 2CV-5102-2 valve operators removed:

| Valve Number | Valve Function | Valve Position |
|---|---|---|
| 2CV-5101-1 | HPSI Hot Leg Injection Isolation | Closed |
| 2CV-5102-2 | HPSI Hot Leg Injection Isolation | Closed |
| 2BS-26 | RWT Return Line | Open |

b. At least once per 31 days by verifying that each valve (manual, power operated or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

c. ~~By a visual inspection which verifies that no loose debris (rags, trash, clothing, etc.) is present in the containment which could be transported to the containment sump and cause restriction of the pump suctions during LOCA conditions. This visual inspection shall be performed:~~DELETED

~~1. For all accessible areas of the containment prior to establishing CONTAINMENT INTEGRITY, and~~

~~2. At least once daily of the areas affected within containment if containment has been entered that day, and during the final entry when CONTAINMENT INTEGRITY is established.~~

d. ~~At least once per 18 months by a visual inspection of the containment sump and verifying that the subsystem suction inlets are not restricted by debris and that the sump components (trash racks, screens, etc.) show no evidence of structural distress or corrosion.~~DELETED

e. In accordance with the Surveillance Frequency Control Program, during shutdown, by:

1. Verifying that each automatic valve in the flow path actuates to its correct position on SIAS and RAS test signals.

2. Verifying that each of the following pumps start automatically upon receipt of a Safety Injection Actuation Test Signal:

a. High-Pressure Safety Injection pump.

b. Low-Pressure Safety Injection pump.

CONTAINMENT SYSTEMS

CONTAINMENT SUMP

LIMITING CONDITION FOR OPERATION

3.6.4.1 The containment sump shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With the containment sump inoperable due to containment accident generated and transported debris exceeding the analyzed limits, LCO 3.5.2, "ECCS Subsystems – $T_{avg} \geq 300$ °F," LCO 3.5.3, "ECCS Subsystems – $T_{avg} < 300$ °F," and LCO 3.6.2.1, "Containment Spray System," may be considered met provided:

   1. Action is initiated immediately to mitigate containment accident generated and transported debris, and

   2. SR 4.4.6.2.1.a is performed once every 24 hours, and

   3. The containment sump to restored to OPERABLE status within 90 days.

b. With the containment sump inoperable for reasons other than ACTION a:

   1. Immediately enter applicable ACTIONS of LCO 3.5.2, "ECCS Subsystems – $T_{avg} \geq 300$ °F" and LCO 3.5.3, "ECCS Subsystems – $T_{avg} < 300$ °F," for emergency core cooling trains made inoperable by the containment sump, and

   2. Immediately enter applicable ACTIONS of LCO 3.6.2.1, "Containment Spray System," for containment spray trains made inoperable by the containment sump, and

   3. Restore the containment sump to OPERABLE status within 72 hours.

Otherwise, be in HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.6.4.1.1 At least once per 18 months verify, by visual inspection, the containment sump does not show structural damage, abnormal corrosion, or debris blockage.

**Enclosure Attachment 2 to**

**2CAN121801**

**Re-Typed Technical Specification Pages**

4.5.2 Each ECCS subsystem shall be demonstrated OPERABLE:

a. In accordance with the Surveillance Frequency Control Program by verifying that the following valves are in the indicated positions with power to the 2CV-5101-1 and 2CV-5102-2 valve operators removed:

| Valve Number | Valve Function | Valve Position |
|---|---|---|
| 2CV-5101-1 | HPSI Hot Leg Injection Isolation | Closed |
| 2CV-5102-2 | HPSI Hot Leg Injection Isolation | Closed |
| 2BS-26 | RWT Return Line | Open |

b. At least once per 31 days by verifying that each valve (manual, power operated or automatic) in the flow path that is not locked, sealed, or otherwise secured in position, is in its correct position.

c. DELETED

d. DELETED

e. In accordance with the Surveillance Frequency Control Program, during shutdown, by:

1. Verifying that each automatic valve in the flow path actuates to its correct position on SIAS and RAS test signals.

2. Verifying that each of the following pumps start automatically upon receipt of a Safety Injection Actuation Test Signal:

a. High-Pressure Safety Injection pump.

b. Low-Pressure Safety Injection pump.

CONTAINMENT SYSTEMS

CONTAINMENT SUMP

LIMITING CONDITION FOR OPERATION

3.6.4.1 The containment sump shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4.

ACTION:

a. With the containment sump inoperable due to containment accident generated and transported debris exceeding the analyzed limits, LCO 3.5.2, "ECCS Subsystems – $T_{avg}$ ≥ 300 °F," LCO 3.5.3, "ECCS Subsystems – $T_{avg}$ < 300 °F," and LCO 3.6.2.1, "Containment Spray System," may be considered met provided:

   1. Action is initiated immediately to mitigate containment accident generated and transported debris, and

   2. SR 4.4.6.2.1.a is performed once every 24 hours, and

   3. The containment sump to restored to OPERABLE status within 90 days.

b. With the containment sump inoperable for reasons other than ACTION a:

   1. Immediately enter applicable ACTIONS of LCO 3.5.2, "ECCS Subsystems – $T_{avg}$ ≥ 300 °F" and LCO 3.5.3, "ECCS Subsystems – $T_{avg}$ < 300 °F," for emergency core cooling trains made inoperable by the containment sump, and

   2. Immediately enter applicable ACTIONS of LCO 3.6.2.1, "Containment Spray System," for containment spray trains made inoperable by the containment sump, and

   3. Restore the containment sump to OPERABLE status within 72 hours.

Otherwise, be in HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

SURVEILLANCE REQUIREMENTS

4.6.4.1.1 At least once per 18 months verify, by visual inspection, the containment sump does not show structural damage, abnormal corrosion, or debris blockage.

**Enclosure Attachment 3 to**

**2CAN121801**

**Proposed Technical Specification Bases Changes (Mark-Up)**
**(Information Only)**

## 3/4.6.4.1 CONTAINMENT SUMP

### BACKGROUND

The containment sump provides a borated water source to support recirculation of coolant from the containment sump for residual heat removal, emergency core cooling and containment spray during accident conditions.

The containment sump supplies both trains of the the Containment Spray System (CSS) and the High Pressure Safety Injection (HPSI) portion of the Emergency Core Cooling System (ECCS) during any accident that requires recirculation of coolant from the containment sump. The recirculation mode is initiated when the HPSI and CSS pump suction is transferred to the containment sump on low Refueling Water Tank (RWT) level, which ensures the containment sump has enough water to meet the net positive suction head (NPSH) requirements of the pumps. The use of a single containment sump to supply both trains of the ECCS and CSS is acceptable since the containment sump is a passive component, and passive failures are not required to be assumed to occur coincident with Design Basis Events.

The containment sump contains strainers to limit the quantity of the debris materials from entering the sump suction piping. Debris accumulation on the strainers can lead to undesirable hydraulic effects including air ingestion through vortexing or deaeration, and reduced NPSH at pump suction piping.

While the majority of debris accumulates on the strainers, some fraction penetrates the strainers and is transported to downstream components in the ECCS, CSS, and the Reactor Coolant System (RCS). Debris that penetrates the strainer can result in wear to the downstream components, blockages, or reduced heat transfer across the fuel cladding. Excessive debris in the containment sump water source could result in insufficient recirculation of coolant during the accident, or insufficient heat removal from the core during the accident.

### APPLICABLE SAFETY ANALYSIS

During all accidents that require recirculation, the containment sump provides a source of borated water to the ECCS and CSS pumps. As such, it supports residual heat removal, emergency core cooling, containment cooling, and containment atmosphere cleanup during an accident. It also provides a source of negative reactivity. Further information related to the systems supported by the containment sump is included in B 3.5.2, " ECCS Subsystems – $T_{avg}$ ≥ 300 °F," B 3.5.3, " ECCS Subsystems – $T_{avg}$ < 300 °F," and B 3.6.2.1, "Containment Spray System."

SAR Section 6.2.2.2 describes evaluations that confirm long-term core cooling is assured following any accident that requires recirculation from the containment sump.

The containment sump satisfies Criterion 3 of 10 CFR 50.36(c)(2)(ii).

3/4.6.4.1 CONTAINMENT SUMP (continued)

LCO

The containment sump is required to ensure a source of borated water to support ECCS and CSS OPERABILITY. A containment sump consists of the containment drainage flow paths (drains that enter the reactor building sump directly contain screens, caps, and/or strainers), the containment sump strainers, and the inlet to the ECCS and CSS piping. An OPERABLE containment sump has no structural damage or abnormal corrosion that could prevent recirculation of coolant and will not be restricted by containment accident generated and transported debris.

Containment accident generated and transported debris consists of the following:

a. Accident generated debris sources – Insulation, coatings, and other materials which are damaged by the high-energy line break (HELB) and transported to the containment sump. This includes materials within the HELB zone of influence and other materials (e.g., unqualified coatings) that fail due to the post-accident containment environment following the accident;

b. Latent debris sources – Pre-existing dirt, dust, paint chips, fines or shards of insulation, and other materials inside containment that do not have to be damaged by the HELB to be transported to the containment sump; and

c. Chemical product debris sources – Aluminum, zinc, carbon steel, copper, and non-metallic materials such as paints, thermal insulation, and concrete that are susceptible to chemical reactions within the post-accident containment environment leading to corrosion products that are generated within the containment sump pool or are generated within containment and transported to the containment sump.

Containment debris limits are defined in engineering calculations.

APPLICABILITY

In MODES 1, 2, 3, and 4, containment sump OPERABILITY requirements are dictated by the ECCS and CSS OPERABILITY requirements. Since the ECCS must be OPERABLE in MODES 1, 2, 3, and 4, the containment sump must also be OPERABLE to support ECCS operation.

In MODES 5 and 6, the probability and consequences of these events are reduced due to the pressure and temperature limitations of these MODES. Thus, the containment sump is not required to be OPERABLE in MODES 5 or 6.

3/4.6.4.1 CONTAINMENT SUMP (continued)

ACTIONS

a.1, a.2, and a.3

ACTION A is applicable when there is a condition which results in containment accident generated and transported debris exceeding the analyzed limits. Containment debris limits are defined in engineering calculations.
Immediate action must be initiated to mitigate the condition. Examples of mitigating actions are:

- Removing the debris source from containment or preventing the debris from being transported to the containment sump;
- Evaluating the debris source against the assumptions in the analysis;
- Deferring maintenance that would affect availability of the affected systems and other LOCA mitigating equipment;
- Deferring maintenance that would affect availability of primary defense-in-depth systems, such as containment coolers;
- Briefing operators on LOCA debris management actions; or
- Applying an alternative method to establish new limits.

While in this condition, the RCS water inventory balance, SR 4.4.6.2.1.a, must be performed at an increased Frequency of once per 24 hours. An unexpected increase in RCS leakage could be indicative of an increased potential for an RCS pipe break, which could result in debris being generated and transported to the containment sump. The more frequent monitoring allows operators to act in a timely fashion to minimize the potential for an RCS pipe break while the containment sump is inoperable.

The inoperable containment sump must be restored to OPERABLE status in 90 days. A 90-day allowable outage time (AOT) is reasonable for emergent conditions that involve debris in excess of the analyzed limits that could be generated and transported to the containment sump under accident conditions. The likelihood of an initiating event in the 90-day AOT is very small and there is margin in the associated analyses. The mitigating actions of ACTION a.1 provides additional assurance that the effects of debris in excess of the analyzed limits will be mitigated during the AOT.

b.1, b.2, and b.3

When the containment sump is inoperable for reasons other than ACTION a, such as blockage, structural damage, or abnormal corrosion that could prevent recirculation of coolant, it must be restored to OPERABLE status within 72 hours. The 72-hour AOT takes into account the reasonable time for repairs, and low probability of an accident that requires the containment sump occurring during this period.

3/4.6.4.1 CONTAINMENT SUMP (continued)

ACTIONS (continued)

b.1, b.2, and b.3 (continued)

ACTION b.1 requires that the applicable actions of LCO 3.5.2, " ECCS Subsystems – $T_{avg} \geq 300$ °F," and LCO 3.5.3, "ECCS Subsystems – $T_{avg} < 300$ °F," be entered if an inoperable containment sump results in an inoperable ECCS train. In addition, ACTION b.2 requires that the applicable actions of LCO 3.6.2.1, "Containment Spray System," be entered if an inoperable containment sump results in an inoperable CSS train.

If the associated AOTs of ACTIONs a.1, a.2, a.3, b.1, b.2, and/or b.3 are not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 (HOT STANDBY) within 6 hours and to MODE 5 (COLD SHUTDOWN) within the following 30 hours. The AOTs are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 4.6.4.1.1

Periodic inspections are performed to verify the containment sump does not show current or potential debris blockage, structural damage, or abnormal corrosion to ensure the operability and structural integrity of the containment sump. The 18-month Frequency is based on the need to perform this Surveillance during a refueling outage, because of the need to enter containment. This Frequency is sufficient to detect any indication of structural damage, abnormal corrosion, or debris blockage of the containment sump.