10 CFR 50.90

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March 6, 2024

U.S. Nuclear Regulatory Commission
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Subject: **Palo Verde Nuclear Generating Station Units 1, 2, and 3**
Docket Nos. STN 50-528, 50-529, and 50-530
Renewed Operating License Nos. NPF-41, NPF-51, and NPF-74
Response to Request for Additional Information to Revise Technical Specifications (TS) 3.5.1, Safety Injection Tanks (SITs) – Operating, TS 3.5.2, Safety Injection Tanks (SITs) – Shutdown, and TS 3.6.5, Containment Air Temperature

By letter number 102-08610, dated June 29, 2023 [Agencywide Documents Access and Management System (ADAMS) Accession Number ML23180A222], Arizona Public Service Company (APS) submitted a license amendment request (LAR) for Nuclear Regulatory Commission (NRC) approval for Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3.

The NRC staff requested additional information to complete their review regarding the proposed LAR. A clarifying phone call was held between the NRC staff and APS on November 28, 2023, to discuss the additional information needed. The APS response to the request for additional information (ADAMS Accession Number ML23334A007) is provided in the enclosure to this letter.

No new commitments are being made to the NRC by this letter. Should you need further information regarding this letter, please contact Matthew S. Cox, Licensing Department Leader, at (623) 393-5753.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed on March 6, 2024
(Date)

Sincerely,

Horton, Todd (Z10098)
Digitally signed by Horton, Todd (Z10098)
Date: 2024.03.06 07:25:00 -07'00'

TAH/MSC/cr

Enclosure: Response to Request for Additional Information to Revise Technical Specifications (TS) 3.5.1, Safety Injection Tanks (SITs) – Operating, TS 3.5.2, Safety Injection Tanks (SITs) – Shutdown, and TS 3.6.5, Containment Air Temperature

cc:	J. D. Monninger	NRC Region IV Regional Administrator
	W. T. Orders	NRC NRR Project Manager for PVNGS
	L. N. Merker	NRC Senior Resident Inspector for PVNGS
	B. D. Goretzki	Arizona Department of Health Services – Bureau of Radiation Control

Enclosure

Response to Request for Additional Information to Revise Technical Specifications (TS) 3.5.1, Safety Injection Tanks (SITs) – Operating, TS 3.5.2, Safety Injection Tanks (SITs) – Shutdown, and TS 3.6.5, Containment Air Temperature

Introduction

By letter dated June 29, 2023 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML23180A222), Arizona Public Service Company (APS, the licensee) submitted a license amendment request (LAR) for U.S Nuclear Regulatory Commission (NRC) approval for Palo Verde Nuclear Generating Station, Units 1, 2, and 3 (Palo Verde, PVNGS), by requesting the following changes:

- Surveillance Requirement (SR) 3.5.1.2 for Technical Specification (TS) 3.5.1, "Safety Injection Tanks (SITs) – Operating,"
- SR 3.5.2.2 for TS 3.5.2, "Safety Injection Tanks (SITs) – Shutdown,"
- Limiting Condition for Operation (LCO) for TS 3.5.2, and
- LCO for TS 3.6.5, "Containment Air Temperature."

The LAR proposes to revise the Palo Verde current licensing basis to express the SIT volumes in cubic feet (ft^3) instead of percent level and proposes adjustments to the containment air temperature values to eliminate incorporation of margin between the design values and the TS values. After reviewing the enclosure of the licensee's letter dated June 29, 2023, the NRC staff requested the licensee to provide responses to the following official requests for additional information (RAIs). The NRC transmitted draft RAIs to APS on October 5, 2023, scheduled the clarification call on November 6, 2023, which was cancelled due to Unit 1 outage conflict, and eventually held a clarification call on November 28, 2023, to discuss the draft RAIs. As mutually agreed during this clarification call, the responses to these official RAIs were to be submitted by January 19, 2024 (ADAMS Accession Number ML23334A007). However, during the RAI response development, an offset between the TS 3.5.2 Bases and the supporting legacy engineering analyses was identified and entered into the PVNGS corrective action program, which delayed this RAI response.

The principal design criteria for Palo Verde were developed in consideration of the seventy General Design Criteria (GDC) for nuclear power plant construction permits proposed by the Atomic Energy Commission in a proposed rulemaking published for Title 10 of the Code of Federal Regulations (10 CFR) Part 50 in the Federal Register of July 11, 1967. The principal design criteria from the Palo Verde Updated Final Safety Analysis Report (UFSAR) section 3.1 that is applicable is referred to in the regulatory basis for the RAIs given below. The NRC RAI is stated first followed by the APS response.

NRC RAIs and APS Responses

<u>NRC Nuclear Systems Performance Branch (SNSB) RAI-1</u>

Regulatory Basis:

The following 10 CFR Part 50, Appendix A, General Design Criteria (GDC) are applicable:

- GDC 16, "Containment design," as it relates to providing a reactor containment and associated systems to establish an essentially leak-tight barrier against the uncontrolled release of radioactivity to the environment and to assure that the containment design conditions important to safety are not exceeded for as long as postulated accident conditions require.

- GDC 38, "Containment heat removal," as it relates to providing a system to remove heat from the reactor containment whose safety function is to reduce rapidly, consistent with the functioning of other associated systems, the containment pressure and temperature following any loss-of-coolant accident (LOCA) and maintain them at acceptably low levels.

- GDC 50, "Containment design basis," as it relates to designing the reactor containment structure, including access openings, penetrations, and the containment heat removal system so that the containment structure and its internal compartments can accommodate, without exceeding the design leakage rate and with sufficient margin, the calculated pressure and temperature conditions resulting from any LOCA.

RAI:

Palo Verde UFSAR, Table 6.2.1-7, "Engineered Safety Systems Operating Assumptions for Containment Peak Pressure Analysis – at 102% of 3990" (ML23181A166), states that for containment peak pressure analysis inputs at 102% of 3990 megawatts thermal (MWt), the SIT volume is 1914 ft^3 /tank.

(a) As noted in UFSAR, Table 6.2.1-7, the containment response in the current licensing basis (CLB) is based on SIT volume, which is different from either the minimum or the maximum volumes specified in the proposed LCOs 3.5.1 and 3.5.2. Provide impact on the peak pressure, peak vapor temperature, and peak sump temperature containment analysis of record based on the most conservative value of the SIT volumes proposed in LCOs 3.5.1 and 3.5.2.

(b) From the containment peak pressure and peak temperature response standpoint, what is the most conservative SIT volume and explain why it is conservative for both operating and shutdown conditions.

(c) In case it is determined there is no impact on the containment pressure and temperature response, provide a technical justification that the currently used SIT volume 1914 ft^3 /tank is most conservative.

<u>APS Response to SNSB RAI-1</u>

(a) The highest peak pressure, peak vapor temperature, and peak sump temperature are not measurably impacted by the SIT water volume selected to be used in the analyses. What produces a conservative containment response is selecting a conservative model for nitrogen injection. Since nitrogen is used to pressurize the SITs, it is released to the containment atmosphere once the SITs are emptied of their water inventory, thus increasing containment pressure and temperature. (References 1, 2 and 3)

During the Loss of Coolant Accident (LOCA) progression, large amounts of liquid / steam are released / blown down. The water volume in the SITs is a small fraction of the total when compared to the overall Reactor Coolant System (RCS). From thermodynamic principles, there is only a certain amount of steam from condensable gases that can fit within containment and adding more condensable gases (i.e., water from the SITs) does not raise the containment pressures nor temperature as the gases (water vapor / steam) will condense. However, non-condensable gases such as nitrogen do have the capability of influencing the containment response. Nitrogen partial pressures can raise the containment overall pressure.

Sensitivity runs are performed in the analyses (References 1 and 2) to ensure modeling of the event produces conservative results. Calculation 13-NC-ZC-0206, *Loss of Coolant Accident Containment Pressure and Temperature Transient Analysis* (Reference 1), runs multiple non-bounding post-LOCA pressure and temperature responses of the containment. A model (and associated values) that maximizes the containment pressures and temperatures is selected for the limiting case analysis of record in calculation 13-NC-ZC-0232, *Loss of Coolant Accident Pressure and Temperature Containment Analysis for Limiting Case* (Reference 2), and for the long-term system analysis, calculation 13-NC-ZC-0238, *System Design LOCA Analysis* (Reference 3). Specific to nitrogen injection, sensitivity runs in the analyses investigate the effect of modeling nitrogen injection to select the most conservative approach that will produce bounding containment results.

From References 1, 2, and 3, the nitrogen injection from one SIT is modeled as direct injection into the containment atmosphere following the blowdown of one SIT at a constant rate at 30 seconds. This approach is highly simplistic in that it does not mechanistically determine the nitrogen release rate as the pressure in the SIT is decreasing, and consequently, predicts much higher nitrogen mass release. This results in higher containment pressures and temperatures reported by the calculation. The effect of one SIT is directly entered into the program used to calculate containment pressures and temperatures but sensitivity analyses indicate including it contributed 0.1 psi and 0.1 °F to the calculated maximum pressures and temperatures.

The three remaining SITs would not discharge immediately; so instead, the nitrogen injection from the three remaining SITs is conservatively (as a lump sum) directly added on top of the overall peak calculated pressures and temperatures, resulting in a calculated increase of 0.31 psi and 0.94 °F for all three SITs. The methodology used to determine the pressure and temperature effects of the three SITs is based on a containment back pressure that is lower (by approximately 20 psi) than the peak containment pressure and on the maximum nitrogen pressure (SIT pressure); therefore, less nitrogen would actually discharge than is calculated. A conservative 2406 ft^3 per SIT is used as the nitrogen volume. However, the exact volume is not as relevant to the calculation results, as the containment back pressure and nitrogen pressure, because only a certain quantity of nitrogen can be released based on the pressures, after which the remaining nitrogen left in the tank has no impact on the containment response.

The nitrogen injection is also modeled as discharging to a pure air environment with the air mass present before the accident. This is conservative since at the time of the peak pressure, there will be much more mass and energy (steam) in containment. Therefore, the addition of nitrogen would actually represent a smaller percentage increase in the total gas mass in containment than is modeled; this would lead to the nitrogen having less effect on the containment pressure and temperature. The calculated results (which includes the blowdown from one SIT) plus the lump sum nitrogen addition (from the three remaining SITs) are then reported as the overall calculation results.

Listing a SIT water volume in UFSAR Table 6.2.1-7 was an editorial decision. As stated above, what produces conservative containment results with respect to the SITs is selecting a conservative nitrogen injection model. This nitrogen model is not related to the LAR nor was it updated as a result of the LAR; the nitrogen model remains conservative. Since the SIT water volume does not measurably impact the containment pressure and temperatures as documented in References 1, 2, and 3, a revision to UFSAR Table 6.2.1-7 has been captured in the PVNGS corrective action program to remove the SIT volume of 1914 ft^3/tank.

(b) Please see above response. SIT water volume does not influence the measurable conservatism of the results.

(c) There is no impact to the containment pressure and temperature response as a result of this LAR. The currently listed SIT volume in UFSAR Table 6.2.1-7 is neither conservative nor non-conservative for the purposes of containment response post LOCA. As described above in item (a), the SIT LOCA nitrogen injection model is what has the capability to influence the containment response results. PVNGS uses a conservative model for nitrogen injection.

NRC SNSB RAI-2

Regulatory Basis: Same as in SNSB RAI-1

RAI:

The current TS values in volumetric units for LCO 3.5.2 are a minimum of 1029.2 ft^3 and a maximum of 1914 ft^3 for four operable SITs and a minimum of 1451.5 ft^3 and a maximum of 1914 ft^3 for three operable SITs. In the proposed TS change, these values are a minimum of 908 ft^3 and a maximum of 2000 ft^3 for four operable SITs and a minimum of 1361 ft^3 and a maximum of 2000 ft^3 for three operable SITs.

(a) What is the technical basis for 908 ft^3 and 2000 ft^3?

(b) Provide the key features of the safety analysis (such as inputs, assumptions, methodology, and results) which includes the 908 ft^3 and 2000 ft^3.

APS Response to SNSB RAI-2(a)

(a) SNSB RAI-2 pertains to proposed changes to TS 3.5.2, *Safety Injection Tanks (SITs) – Shutdown*, for which the TS APPLICABILITY statement is MODE 3 (Hot Standby) and MODE 4 (Hot Shutdown) with pressurizer pressure < 1837 psia. Pursuant to NRC guidance for Emergency Core Cooling System (ECCS) Limiting Condition for Operation (LCO) requirements in lower modes of operation [see, for example, NRC Inspection Manual, Part 9900, *Technical Guidance*, Chapter STS10, *Standard Technical Specifications, STS Section 1, Operability*, Section C.3, *Applicable Operating Conditions* (Reference 4)], the technical bases for the proposed TS 3.5.2 LCO values are derived from deterministic engineering analysis of lower mode plant conditions, not from the MODE 1 (Power Operation) LOCA analyses described in PVNGS UFSAR Section 6.3, *Emergency Core Cooling System*.

The lower mode technical bases for the proposed TS 3.5.2 LCO requirements are as follows:

Minimum SIT Borated Water Volume

The proposed changes to TS 3.5.2 will specify a minimum actual borated water volume of > 908 ft^3 per SIT when four SITs are OPERABLE, and a minimum actual borated water volume of > 1361 ft^3 per SIT when three SITs are OPERABLE. These values correspond to the amount of water that would be necessary for the SITs to fill the reactor vessel above the top of the active core assuming: (1) a lower mode LOCA involving a postulated RCS cold leg break; (2) the loss of inventory from one OPERABLE SIT through the postulated cold leg break to containment; (3) an empty reactor vessel (that is, no RCS coolant inventory is retained in the reactor vessel after the break occurs and before the SITs inject into their respective cold legs); and (4) no analytical credit taken for High Pressure Safety Injection (HPSI) pump flow into the reactor vessel before the SITs have emptied.

The reactor vessel is illustrated in UFSAR Figure 4.1-1, *Reactor Vertical Arrangement*, and associated volumetric data is delineated in UFSAR Table 4.4-10, *Reactor Coolant System Geometry* (Reference 5). The volumes in UFSAR Table 4.4-10 that the SITs must fill following a lower mode LOCA include the lower plenum (430.2 ft^3), the lower core support structure and lower inactive core (239.2 ft^3), the core shroud bypass (240.6 ft^3), the active core (888.2 ft^3 to 911.6 ft^3, with a full core comprised of Westinghouse 16x16 Next Generation Fuel requiring more inventory than other types of PVNGS fuel), and portions of the upper inactive core and downcomer to a plant elevation above the active core. A lower mode design analysis (Reference 6) established a total required volume of 2721.3 ft^3, which would be sufficient to flood the reactor vessel above the top of the active core regardless of the fuel type in the reactor vessel.

When four SITs are OPERABLE and the inventory in one is assumed to be lost through the postulated cold leg break, the three remaining SITs must each contain at least (2721.3 ft^3 ÷ 3), or 907.1 ft^3 of inventory. This value is rounded up to 908 ft^3 in the proposed TS 3.5.2. Likewise, when three SITs are OPERABLE and the inventory in one is assumed to be lost through the postulated cold leg break, the two remaining SITs must each contain at least (2721.3 ft^3 ÷ 2), or 1360.65 ft^3 of inventory. This value is rounded up to 1361 ft^3 in the proposed TS 3.5.2.

<u>Maximum SIT Borated Water Volume</u>

PVNGS Technical Specifications established the maximum SIT water volume in MODES 1 and 2, and MODES 3 and 4 with pressurizer pressure ≥ 1837 psia, as 72% narrow range (NR) level as indicated in the control room. The 72% NR level is equivalent to a volume of 1914 ft^3. A water volume of 1914 ft^3 is also equivalent to 83% wide range (WR) level (Reference 7, Figure 2). Applying the instrument uncertainty to the WR level instrument results in a WR level of 87.3% (Reference 7, Table 20). The 87.3% of WR Level translates into a volume of 2000 ft^3 (Reference 7, Figure 2).

The total volume of a SIT is 2406 ft^3 (Reference 8), and this volume must include the volume of the gas and the water without the SIT being effectively water solid. The volume of 2000 ft^3 is less than the total volume of the SIT, and the equivalent WR level is such that the WR level instrument span indicated in the control room is readable such that the reactor operator will be able to notice any changes in the water volume.

<u>Minimum Gas Pressure relationship to Water Volume</u>

As SIT water volume increases, the required SIT pressure to discharge that volume for the LOCA event increases. Therefore, the following must be considered when making the determination of the SIT volume in the lower modes. Technical Specification Surveillance Requirement (SR) 3.5.2.3 (Reference 9) states the lowest possible SIT pressure is 260 psig (indicated pressure). Accounting for instrument uncertainty this gives a lowest SIT pressure of 249.2 psia (actual pressure) (Reference 10). Hence the minimum SIT water volume, maximum SIT water volume, and any water volume between those limits, must be able to discharge enough water to satisfy the SIT design function requirement of filling the reactor vessel above the active core.

Using the ideal gas law for isentropic expansion, we get the following equation for determination of an initial SIT water volume that will discharge enough water to satisfy the SIT design function requirement of filling the reactor vessel above the active core. When at a minimum LCO pressure (249.2 psia actual pressure), the SIT must be capable of discharging at least the required minimum water inventory to be delivered to the reactor vessel.

$$P_1 = P_2 \left(\frac{V_2}{V_1}\right)^k$$

Where:

V_1= initial gas volume, ft^3
P_1= initial pressure of gas, psia
V_2= final gas volume, ft^3
P_2= final pressure of gas, psia
k= Compressibility Constant [specific heat ratio C_p/C_v] (1.41, for Nitrogen)

APS Response to SNSB RAI-2(b)

(b) The following Assumptions were used in the analysis:

1. The reactor has been shut down for least one-half hour before the postulated lower mode LOCA.

2. There is little or no steam binding in the RCS when the SITs inject water into the core.

3. The SITs that inject into the core must contain the minimum amount of water to cover the active core.

4. An elevation head of zero feet is assumed between the SIT and the reactor vessel. This assumption conservatively neglects the fact that the SITs are situated above the RCS cold leg piping, and that a SIT discharge would be assisted by gravitational acceleration by a small degree.

5. The ideal gas model is assumed to be an accurate representation of the nitrogen gas in each SIT. The ideal gas model neglects particle-to-particle interactions and is valid when pressures and temperatures are not extreme.

6. One of the operable SITs is assumed to be lost to the LOCA break. This assumption accounts for the fact that the LOCA break may occur on RCS piping attached to any one of the SITs.

7. Heat transfer between the nitrogen gas in the SITs and containment atmosphere is neglected. The SITs would initially be at the same temperature as the containment atmosphere prior to a postulated LOCA. As the SITs discharge, the expanding nitrogen gas volume rapidly cools due to the Joule-Thomson effect, creating a momentary temperature gradient. The total amount of heat transfer is negligible because the SITs discharge on a time scale of approximately a minute. Further, the metallic tank walls have higher thermal conductivities than nitrogen gas and would preferentially absorb ambient heat.

The following Inputs are used in the analysis:

1. Total internal volume of each SIT is 2406 ft^3 (Reference 8).

2. Total required volume of 2721.3 ft^3, which would be sufficient to flood the reactor vessel above the top of the active core regardless of the fuel type in the reactor vessel.

3. Final pressure of the SIT gas is 30 psia. RCS pressure during lower-mode LOCA reflood. This value was used by original SIT level analysis (Reference 6). It was also developed in original Combustion Engineering analysis (Reference 6) as the upper plenum pressure for large breaks in the process of calculating core heat transfer coefficients during reflood. These Combustion Engineering documents are historical, this 30 psia value is used because the resulting containment pressure profile in Reference 6 is consistent with UFSAR Figure 6.3.3a.2-1F.

4. k = 1.41. Specific heat ratio of nitrogen gas (C_p/C_v). This value is given at 68°F and 14.7 psia in Crane Technical Paper No. 410 Appendix A (Reference 11).

5. The minimum initial SIT pressure with pressurizer pressure less than 1837 psig is 260 psig, or 235 psig (249.2 psia) when accounting for the instrument uncertainty of 25 psi given in 13-JC-SI-0211 (Reference 10).

6. Three or four SITs may be operable during Modes 3 and 4 per Technical Specifications 3.5.2 (Reference 9). SITs are isolated and not required during Modes 5 and 6.

The following methods were used in the analysis:

<u>Minimum SIT Water Volume</u>

The minimum required SIT water volume (V_{req}) is based on the minimum volume of water that will reflood the active core region. It depends on the number of credited SITs (N) as follows:

$$V_{req} = \frac{V_{core}}{N}$$

Where:
V_{req} = minimum required water volume per SIT, ft^3
V_{core} = core reflood volume, ft^3
N = number of credited SITs, one less than the number of Operable SITs

<u>Relationship between Minimum Gas pressure and Water Volume</u>

The nitrogen gas in each SIT is treated as an ideal gas that undergoes adiabatic expansion in which no heat is transferred to or from the gas volume. Adiabatic expansion is characterized by a constant work term PV^k as follows:

$$P_1 V_1^k = P_2 V_2^k$$

$$\Longrightarrow P_1 = P_2 \left(\frac{V_2}{V_1}\right)^k$$

Where:

V_1= initial gas volume, ft^3
P_1= initial pressure of gas, psia
V_2= final gas volume, ft^3
P_2= final pressure of gas, psia
k= Compressibility Constant [specific heat ratio C_p/C_v] (1.41, for Nitrogen)

In summary, the above provides the technical basis for both the 908 ft^3 and 2000 ft^3 water volumes in the SITs. Also provided is the method of verifying the SIT will fulfill its design function when at the minimum allowed actual gas pressure.

<u>NRC SNSB RAI-3</u>

Regulatory Basis: Same as in SNSB RAI-1

RAI:

The LAR, section 3.2 states:

> NUREG-1432, "Standard Technical Specifications [STS], Combustion Engineering Plants, Revision 5.0, Volume 1, Specifications" (ML21258A421), lists the LCO 3.6.5, "Containment Air Temperature (Atmospheric and Dual)," containment average air temperature limit as a bracketed value of 120°F. The intent of the STS is that the initial containment air temperature in the LCO be the design-basis accident analytical limit for containment average air temperature.
>
> The initial pre-accident containment air temperature of 120°F is used in the Palo Verde design-basis accident analyses for both LOCAs and main steam line breaks (MSLBs). However, the current Palo Verde TS LCO 3.6.5 indicated limit is stated as less than or equal to 117°F instead of 120°F. The TS LCO 3.6.5 limit of 117°F has been derived to account for instrument uncertainties, which ensures the analytical limit of 120°F will not be exceeded. This LAR proposes to restore the Palo Verde LCO 3.6.5 value to of less than or equal to 120°F to be consistent with the intent of the STS and Palo Verde design-basis accident analytical limits for containment average air temperature.

The STS 3.6.5 bracketed containment temperature [120°F] is a generic value. For using it as plant specific in Palo Verde TSs, demonstrate that by applying 120°F (plus uncertainties) as an initial containment temperature along with the same other CLB inputs and assumptions, the containment response analysis results remain bounded by the containment design pressure, temperature, and the equipment qualification profile.

<u>APS Response to SNSB RAI-3</u>

Containment average air temperature is an initial condition used in the design basis accident (DBA) analyses that establishes the containment environmental qualification operating envelope for both pressure and temperature. The limit for containment average air temperature ensures that operation is maintained within the assumptions used in the DBA analyses for containment. NUREG-1432, Vol. 1, *Standard Technical Specifications for*

Combustion Engineering Plants, lists LCO 3.6.5, *Containment Air Temperature (Atmospheric and Dual),* limit of 120°F (Reference 12). PVNGS Technical Specifications utilized an analytical limit for containment average air temperature of ≤ 120°F as a station specific value. However, it was changed to an indicated value of ≤ 117°F (accounting for 3°F instrument loop uncertainty) under license amendment (LA) 117 (ADAMS Accession Number ML021720060). LA 117 was considered administrative in nature as it did not change any initial conditions for containment average air temperature used in the PVNGS safety analyses. This LAR (ADAMS Accession No. ML23180A222) restores the containment average air temperature of ≤ 120°F as the LCO limit, reverting to the analytical value instead of an indicated value.

PVNGS containment pressure and temperature accident analyses utilize the containment temperature of 120°F as an initial condition. The following list of PVNGS calculations utilizes the 120°F value:

1. 13-NC-ZC-0206, *Loss of Coolant Accident Containment Pressure and Temperature Transient Analysis* (Reference 1)

2. 13-NC-ZC-0232, *Loss of Coolant Accident Pressure and Temperature Containment Analysis for Limiting Case* (Reference 2)

3. 13-NC-ZC-0238, *System Design LOCA Analysis* (Reference 3)

4. 13-NC-ZC-0233, *Main Steam Line Break Inside Containment Pressure and Temperature Analysis for Structure Integrity and Equipment Qualification* (Reference 13)

5. 13-NC-HJ-0001, *Control Room Dose from a LOCA in an Adjacent Unit* (Reference 14)

The containment HVAC and control element drive mechanism (CEDM) cooling calculations 13-MC-HC-0001, *Containment Building Normal Heat Load Calculation* (Reference 15), and 13-MC-HC-0003, *Containment Building CEDM Cooling System Heat Loads* (Reference 16), utilized the limit of 120°F for heat load determination. Additionally, PVNGS UFSAR (Reference 5) lists the containment temperature analytical limit of 120°F in Chapters 6 and 9.

PVNGS Technical Specifications contain both the LCO limit and Surveillance Requirement (SR) which is implemented by the Control Room Operators in accordance with surveillance testing (ST). The ST procedures reflect the total loop uncertainty calculations which specifies the indicated value to provide reasonable assurance that the analytical limit is not exceeded. Therefore, the TS value of ≤ 120°F does not account for instrument uncertainty and instead it is controlled within the licensee-controlled TS Bases and surveillance procedures, pursuant to 10 CFR 50.59.

This change would not only ensure consistency with the Standard TS, PVNGS UFSAR, and design analyses but also within the PVNGS Technical Specifications as it aligns the TS LCO 3.6.5 with other LCO and SRs which list the design basis analytical value as a limit.

Since the instrument uncertainty is built into the surveillance procedures, restoring the LCO limit for containment average air temperature to ≤ 120°F will ensure that the analytical limit is not exceeded. PVNGS design basis accident analysis analytical temperature limit of 120°F, as an initial conditions for all types of accidents, will remain unchanged. The design basis accident calculations that use containment average air temperature analytical limit of 120°F will be unaffected and remain valid for analysis conditions currently established. Therefore, the containment response analysis results will remain bounded by the containment design pressure, temperature, and the equipment qualification profile.

<u>NRC SNSB RAI-4</u>

Regulatory Basis: Same as in SNSB RAI-1

RAI:

The LAR Section 2.1.2 states:

> This change will more accurately describe the design/analysis limit in the TS and will also allow for future revision to the surveillance procedures to specify the TS SRs 3.5.1.2 and 3.5.2.2 SIT level requirements in terms of either narrow range instrumentation percent or wide range instrumentation percent. This will provide operational flexibility, while still maintaining the current safety analyses requirements and associated SIT level limits and controls. This control would be within the licensee-controlled surveillance procedures, pursuant to 10 CFR 50.59, Changes, tests and experiments, without requiring a formal license amendment. This, in turn, will allow potential PVNGS flexibility while continuing to ensure TS LCO compliance and conformance with the safety analysis.

The LAR Section 2.2.2 states:

> The original PVNGS TS LCO limit for containment average air temperature was ≤ 120°F but it was changed to ≤ 117°F by license amendment (LA) 117 (ADAMS Accession No. ML021720060) … The NRC staff safety evaluation documented the basis for this more restrictive change, to include instrument uncertainty in the LCO, as follows from page 51 of the safety evaluation for LA 117:
>
> <u>ITS 3.6.5</u> <u>CTS LCO 3.6.1.5, containment air temperature, reduced to incorporate instrument uncertainties.</u>
>
> The proposed TS change would revise the maximum containment air temperature from ≤ 120°F to ≤ 117°F, and would change the related Bases. The licensee's reanalysis noted that as much as 3°F of uncertainty may exist for the instruments that monitor containment air temperature. The 120°F is the analytical value utilized as an upper bound initial condition in the containment safety analyses and that 3°F has been determined to be an appropriate plant specific value to account for instrument uncertainty. The change to the CTS is needed to ensure that the 120°F upper limit is not exceeded. This change is a result of the licensee's revised analysis which incorporated instrument uncertainties in the analysis.

Provide justification that not including instrument uncertainty in the TS values will have no impact on analytical limits used as inputs in the design basis for both the LOCA analysis and the containment pressure and temperature response analysis and the analysis results as well.

APS Response to SNSB RAI-4

The current safety analyses and LOCA containment pressure and temperature analyses are not impacted by the proposed changes to TS SRs 3.5.1.2 and 3.5.2.2 (to list SIT volume in TS SRs in only cubic feet units from the safety analyses). These SIT volume requirements are design analysis limits and unchanged (i.e., the values used in the safety analyses are the volumes proposed by the LAR) and as a result, no accident analysis input values or consequences will change and the results for the ECCS performance will remain same. As described in the response of SNSB RAI-1, the LOCA analyses for containment pressure and temperature response are unaffected by the proposed TS changes. (References 1, 2, 3, 14, and 17 - 23; see SNSB RAI-2 response for further details on the specifics contained in References 6 and 7)

Further, the values in both cubic feet and percent level of narrow range or wide range level instruments will continue to be available in associated design basis documents such as calculations and surveillance procedures. Specifically, the SIT borated water volume requirements in terms of tank percent level (with instrument uncertainties included) will remain available to control room operators in surveillance procedures (References 24 – 27).

As described in the response of SNSB RAI-3, the proposed TS limit for containment average air temperature is ≤ 120°F and to ensure this value is not exceeded, PVNGS surveillance procedures (References 24 – 27) continue to verify an indicated temperature value of 117°F to account for the 3°F instrument uncertainty. The current TS LCO limit is 117°F and the TS SR verifies the same value because the current TS limit already accounts for the 3°F instrument uncertainty. By changing the TS limit to 120°F the existing surveillance procedure will continue to verify 117°F. The proposed change restores the containment temperature TS LCO limit from 117°F to 120°F, to provide the analytical value instead of the indicated value. This is an administrative change as it does not change any initial conditions for containment average air temperature used in the PVNGS safety analyses.

Design basis calculations, as listed in references 1, 2, 3, and 13, analyze the containment pressure and temperature after LOCA or main steam line break and utilize 120°F as a pre-accident temperature. Since the design basis accident analysis analytical temperature of 120°F will remain unchanged there is no impact on the LOCA analysis or the containment pressure and temperature response analysis. PVNGS TS Bases (Reference 28) currently lists the containment temperature indicated value of 117°F. To prevent any misunderstanding, TS Bases page B 3.6.5-2 will be updated to eliminate the discussion on the 117°F limit.

Additional NRC Staff Request

In addition, the NRC staff has an editorial comment for your consideration and corrections as noted below:

In the clean pages, for SR 3.5.1.2, the "≥ " needs to be on the 2nd line. Sections 3.3.4.b and 3.3.4.d of the TSTF-GG-05-01, "Writer's Guide for Plant-Specific Improved Technical Specifications," dated June 2005 (attached for your convenience), addresses to need to keep symbols and units on the same line of text as the numbers they address. This is how the TS is formatted in NUREG-1432, the STS consistently cited by the licensee.

Provide the relevant corrected pages per NUREG-1432 along with your RAI responses.

<u>APS Response to the Additional NRC Staff Request</u>

To ensure the TS is formatted per the TSTF-GG-05-01, *Writer's Guide for Plant-Specific Improved Technical Specifications*, dated June 2005, the " ≥ " is corrected to appear on the 2nd line for SR 3.5.1.2 and SR 3.5.1.3. The clean page for SR 3.5.1.2 and SR 3.5.1.3 is provided in Attachment 1.

<u>References</u>

1. PVNGS CALC 13-NC-ZC-0206, *Loss of Coolant Accident Containment Pressure and Temperature Transient Analysis*, Revision 9.

2. PVNGS CALC 13-NC-ZC-0232, *Loss of Coolant Accident Pressure and Temperature Containment Analysis for Limiting Case*, Revision 12.

3. PVNGS CALC 13-NC-ZC-0238, *System Design LOCA Analysis*, Revision 7.

4. NRC Inspection Manual, Part 9900, "Technical Guidance," Chapter STS10, "Standard Technical Specifications, STS Section 1, Operability," through Change Notice No. 86-026 issued May 12, 1986. [NRC ADAMS Accession No. ML080450497].

5. Palo Verde Nuclear Generating Station Units 1, 2, and 3, Updated Final Safety Analysis Report (UFSAR), Revision 22, dated June 2023.

6. Combustion Engineering Analysis 3800-LOCA-063, *CESSAR SIT Technical Specification Modifications*, reference use only October 20, 2010.

7. PVNGS Calculation 13-JC-SI-0210, *Safety Injection Tank Level, Wide Range (Loops SIB-L-311 & L-321 and SIA-L-331 & L-341) Total Loop Uncertainty*, Revision 6, including EDCs 2007-00780, and 2022-00315.

8. SDOC N001-1102-00004, *Project Spec for Safety Inject Tanks VCE 15186,24SE81*, Revision 12.

9. Palo Verde Nuclear Generating Station Units 1, 2, and 3 Technical Specifications, through Amendment no. 221, Units 1, 2, 3.

10. PVNGS Calculation 13-JC-SI-0211, *Safety Injection Tank Pressure (Wide Range) Loops P-311, P-321, and P-341 Total Loop Uncertainty*, Revision 5.

11. Crane Technical Paper No. 410, Appendix A (1988 Edition).

12. NUREG-1432, Volume 1, *Standard Technical Specifications- Combustion Engineering Plants*, "Specifications," Revision 5.

13. PVNGS CALC 13-NC-ZC-0233, *Main Steam Line Break Inside Containment Pressure and Temperature Analysis for Structure Integrity and Equipment Qualification*, Revision 6.

14. PVNGS CALC 13-NC-HJ-0001, *Control Room Dose from a LOCA in an Adjacent Unit*, Revision 7.

15. PVNGS CALC 13-MC-HC-0001, *Containment Building Normal Heat Load Calculation*, Revision 4.

16. PVNGS CALC 13-MC-HC-0003, *Containment Building CEDM Cooling System Heat Loads*, Revision 2.

17. SDOC N001-1102-00004, Revision 12; CE Specification No. 14273-PE-601, Revision 8; *Project Specification for Safety Injection Tanks for Arizona Nuclear Power Project Palo Verde Nuclear Generating Station Unit Numbers 1, 2, and 3*.

18. SDOC N001-0205-00182 Revision 3; Westinghouse Calculation CN-TLA-14-014, Revision 4; *ECCS Performance Analysis Comprehensive Checklist for PVNGS Units 1, 2, and 3 with NGF*

19. SDOC N001-0206-00117 Revision 1; Areva Document 51-9264109-002, Revision 2; *Analytical Input Summary for Palo Verde VQP SBLOCA and RLBLOCA Analyses*

20. PVNGS CALC 13-NC-ZY-0205, *Large Break LOCA Radiological Consequences*, Revision 9.

21. PVNGS CALC 13-NC-ZY-0251, *Small Break LOCA Radiological Consequences*, Revision 5.

22. PVNGS CALC 13-NC-ZY-0287, *Determination of Allowable Control Room Inleakage Following Design Basis Accidents*, Revision 4.

23. PVNGS CALC 13-JC-SI-0200, *Safety Injection Tank Level, Narrow Range (SIN-L-312, 313, 322, 323, 332, 333, 342, & 343) Setpoint and Uncertainty Calculation*, Revision 5.

24. PVNGS PROC 40ST-9ZZM1, *Operations Mode 1 Surveillance Logs*, Revision 75.

25. PVNGS PROC 40ST-9ZZM2, *Operations Mode 2 Surveillance Logs*, Revision 54.

26. PVNGS PROC 40ST-9ZZM3, *Operations Mode 3 Surveillance Logs*, Revision 43.

27. PVNGS PROC 40ST-9ZZM4, *Operations Mode 4 Surveillance Logs*, Revision 37.

28. PVNGS Technical Specification Bases, Revision 77.

<u>Attachment 1</u>

Revised Technical Specification Changes (Re-Typed)

Changed Page

3.5.1-2

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition A, B, or C not met.	D.1 Be in MODE 3. AND D.2 Reduce pressurizer pressure to < 1837 psia.	6 hours 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.5.1.1	Verify each SIT isolation valve is fully open.	In accordance with the Surveillance Frequency Control Program
SR 3.5.1.2	Verify borated water volume in each SIT is ≥ 1750 cubic feet and ≤ 1950 cubic feet.	In accordance with the Surveillance Frequency Control Program
SR 3.5.1.3	Verify nitrogen cover pressure in each SIT is ≥ 600 psig and ≤ 625 psig.	In accordance with the Surveillance Frequency Control Program

(continued)