UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 23, 2022

Mrs. Maria L. Lacal
Executive Vice President/
Chief Nuclear Officer
Mail Station 7605
Arizona Public Service Company
P.O. Box 52034
Phoenix, AZ 85072-2034

SUBJECT: PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3 – EXEMPTION FROM THE REQUIREMENTS OF 10 CFR 50.62 TO DELETE DIVERSE AUXILIARY FEEDWATER ACTUATION SYSTEM USING RISK-INFORMED PROCESS FOR EVALUATIONS (EPID L-2022-LLE-0004)

Dear Mrs. Lacal:

The U.S. Nuclear Regulatory Commission (NRC) has approved the enclosed exemption from specific requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.62, "Requirements for reduction of risk from anticipated transients without scram (ATWS) events for light-water-cooled nuclear power plants," for Palo Verde Nuclear Generating Station, Units 1, 2, and 3 (Palo Verde) per 10 CFR 50.12, "Specific exemptions," which provides authority for NRC to grant exemptions from the requirements of Part 50 upon demonstration of proper justification. This action is in response to Arizona Public Service Company's (the licensee's) application dated January 14, 2022 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML22014A415), as supplemented by letter dated February 22, 2022 (ADAMS Accession No. ML22053A212), that requested exemption from the above regulation to delete diverse auxiliary feedwater actuation system (DAFAS) using risk-informed process for evaluations (RIPE).

The licensee's request is for partial exemption from 10 CFR 50.62(c)(1). The portion of 10 CFR 50.62(c)(1) for which the exemption is requested is shown below in bold.

> (c) *Requirements*. (1) Each pressurized water reactor must have equipment from sensor output to final actuation device, that is diverse from the reactor trip system, **to automatically initiate the auxiliary (or emergency) feedwater system** and initiate a turbine trip under conditions indicative of an ATWS. This equipment must be designed to perform its function in a reliable manner and be independent (from sensor output to the final actuation device) from the existing reactor trip system.

Palo Verde is required to provide a diverse scram system (DSS), DAFAS, and diverse turbine trip (DTT). The exemption request will remove the requirement for the DAFAS from the Palo Verde licensing basis based on the RIPE. This exemption does not alter the requirements for the DSS or DTT at Palo Verde.

The exemption is being forwarded for publication to the Office of the Federal Register.

If you have any questions, please contact me at 301-415-1564 or via e-mail at Siva.Lingam@nrc.gov.

Sincerely,

/RA/

Siva P. Lingam, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-528, STN 50-529,
and STN 50-530

Enclosures:
1. Exemption
2. Safety Evaluation

cc: Listserv

SUBJECT: PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3 – EXEMPTION FROM THE REQUIREMENTS OF 10 CFR 50.62 TO DELETE DIVERSE AUXILIARY FEEDWATER ACTUATION SYSTEM USING RISK-INFORMED PROCESS FOR EVALUATIONS (EPID L-2022-LLE-0004) DATED MARCH 23, 2022

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ADAMS Accession Nos.
LTR/SE: ML22054A005
EXEMPTION: ML22054A006
FRN: ML22054A007 (not included) ***by email**

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DATE	2/23/2022	2/23/2022	2/22/2022
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NAME	MCarpentier/CKreuzberger	JDixon-Herrity (SLee for)	BPham (GSuber for)
DATE	3/17/2022	3/17/2022	3/23/2022
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DATE	3/23/2022		

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ENCLOSURE 1

EXEMPTION TO DELETE DIVERSE AUXILIARY FEEDWATER ACTUATION SYSTEM

ARIZONA PUBLIC SERVICE COMPANY

PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3

DOCKET NOS. STN 50-528, STN 50-529, AND STN 50-530

ENCLOSURE 2

SAFETY EVALUATION RELATED TO 10 CFR 50.12 EXEMPTION TO

DELETE DIVERSE AUXILIARY FEEDWATER ACTUATION SYSTEM

ARIZONA PUBLIC SERVICE COMPANY

PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3

DOCKET NOS. STN 50-528, STN 50-529, AND STN 50-530

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION RELATED TO 10 CFR 50.12 EXEMPTION TO DELETE DIVERSE AUXILIARY FEEDWATER ACTUATION SYSTEM

ARIZONA PUBLIC SERVICE COMPANY

PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3

DOCKET NOS. STN 50-528, STN 50-529, AND STN 50-530

1.0 INTRODUCTION

By application dated January 14, 2022 (Reference 1), as supplemented by letter dated February 22, 2022 (Reference 2), Arizona Public Service Company (APS, the licensee), pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.12, "Specific exemptions," requested an exemption from certain requirements of 10 CFR 50.62, "Requirements for reduction of risk from anticipated transients without scram (ATWS) events for light-water-cooled nuclear power plants," for Palo Verde Nuclear Generating Station Units 1, 2, and 3 (Palo Verde).

This exemption request relates solely to specific requirements in 10 CFR 50.62(c)(1) that includes the provision that there is equipment diverse from the reactor trip system that automatically initiates the auxiliary (or emergency) feedwater system under conditions indicative of an ATWS. The Palo Verde diverse auxiliary feedwater actuation system (DAFAS) fulfills this requirement included in 10 CFR 50.62(c)(1). APS has requested an exemption for Palo Verde to allow elimination of DAFAS from the current licensing basis. Palo Verde will continue to comply with the additional requirement in 10 CFR 50.62(c)(1) to provide a diverse turbine trip (DTT) under ATWS conditions.

2.0 REGULATORY EVALUATION

2.1 Regulatory Requirements

The regulation at 10 CFR 50.62(c)(1) states:

> *Requirements*. (1) Each pressurized water reactor must have equipment from sensor output to final actuation device, that is diverse from the reactor trip system, to automatically initiate the auxiliary (or emergency) feedwater system and initiate a turbine trip under conditions indicative of an ATWS. This equipment must be designed to perform its function in a reliable manner and be independent (from sensor output to the final actuation device) from the existing reactor trip system.

The regulation at 10 CFR 50.62(c)(1) specifically includes the requirement to provide equipment that is diverse from the reactor trip system to automatically initiate the auxiliary (or emergency) feedwater system under the conditions of an ATWS. The Palo Verde DAFAS fulfills this requirement.

Therefore, removal of DAFAS from the Palo Verde licensing basis requires an exemption from this section of the regulations. The proposed request would not exempt Palo Verde from any other requirements of 10 CFR 50.62, including the requirement in 10 CFR 50.62(c)(1), to provide equipment that is diverse from the reactor trip system to automatically initiate a turbine trip under the conditions of an ATWS.

10 CFR 50.65 "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," requires licensees to assess the effectiveness of maintenance on an ongoing basis in a manner which ensures that the desired result, reasonable assurance that key structures, systems, and components (SSCs) are capable of performing their intended function, is consistently achieved.

Pursuant to 10 CFR 50.12, the Commission may grant exemptions from requirements of the regulations in 10 CFR Part 50 for reasons which are (1) the exemption is authorized by law, (2) the exemption will not present an undue risk to the public health and safety, (3) the exemption is consistent with the common defense and security, and (4) special circumstances, as defined in 10 CFR 50.12(a)(2), are present. Special circumstances in accordance with 10 CFR 50.12(a)(2)(iii) involve undue hardship or other costs that are significantly in excess of those contemplated when the regulation was adopted, or that are significantly in excess of those incurred by others similarly situated.

2.2 Regulatory Guidance

Palo Verde submitted for review the proposed exemption request under the U.S. Nuclear Regulatory Commission (NRC) Risk-Informed Process for Evaluations (RIPE) as described in the Office of Nuclear Reactor Regulation (NRR) temporary staff guidance (TSG) document TSG-DORL-2021-01, Revision 1 (Reference 3). This guidance provides NRR staff the framework for the streamlined processing of license amendment requests and exemption requests from NRC requirements submitted under RIPE. Use of this guidance is limited to issues for which the safety impact associated with an issue addressed by an exemption or a license amendment request can be modeled using probabilistic risk assessment (PRA). The NRC's review is streamlined in that RIPE is based on the application of pre-existing risk informed criteria that allow for review and disposition of the submittal with minimal resources.

RIPE as described in Reference 3 is available to licensees that have a technically acceptable PRA and have established an integrated decisionmaking panel (IDP). For the purposes of RIPE, having a technically acceptable PRA must be demonstrated by having an approved and implemented license amendment for Technical Specifications Task Force (TSTF) Traveler TSTF-505, "Provide Risk-Informed Extended Completion Times – RITSTF [Risk-Informed TSTF] Initiative 4b" (Reference 13) or TSTF-425 "Relocate Surveillance Frequencies to Licensee Control - RITSTF Initiative 5b" (Reference 14). Under the RIPE process, an IDP may be established by having an approved and implemented 10 CFR 50.69, "Risk-informed categorization and treatment of structures, systems and components for nuclear power plants," amendment or by establishing a RIPE IDP, as documented in the Nuclear Energy Institute (NEI) guidance, "NEI Guidelines for the Implementation of the Risk-Informed Process for Evaluations Integrated Decision-Making Panel" (Reference 4). Per Reference 3, licensees that have

implemented an NRC-approved amendment to adopt TSTF-505 or TSTF-425 and have established an IDP can leverage these initiatives to perform safety impact characterizations using RIPE and request licensing actions with the expectation that the NRC will use a streamlined review process if the issue is characterized as having a minimal safety impact.

For RIPE, as described in Reference 3, all the following must apply in order to characterize an issue as having a minimal safety impact:

- The issue contributes less than 1×10^{-7}/year to core damage frequency (CDF);
- The issue contributes less than 1×10^{-8}/year to large early release frequency (LERF);
- The issue has no safety impact or minimal safety impact in accordance with "Guidelines for Characterizing the Safety Impact of Issues" (Reference 5); and
- Cumulative risk is assessed based on plant-specific CDF and LERF. Cumulative risk is acceptable for the purposes of this guidance if baseline risk remains less than 1×10^{-4}/year for CDF and less than 1×10^{-5}/year for LERF once the impact of the proposed change is incorporated into baseline risk.

The safety impact must be characterized as none or minimal for the submittal to qualify for the NRC streamlined RIPE review. Per Reference 3, the RIPE exemption request must include defense-in-depth and safety margin considerations assessed by the IDP.

3.0 TECHNICAL EVALUATION

Pursuant to 10 CFR 50.12, APS requested an exemption from one of the requirements of 10 CFR 50.62(c)(1). The proposed exemption request would allow elimination of DAFAS from the current licensing basis at Palo Verde. DAFAS fulfills the requirement in 10 CFR 50.62(c)(1) to provide equipment to automatically initiate the auxiliary feedwater system under ATWS conditions that is diverse from the reactor trip system. Palo Verde will continue to comply with the requirement in 10 CFR 50.62(c)(1) to provide a DTT under ATWS conditions.

As discussed in *Federal Register* (FR) Notice 49 FR 26036–26044, 10 CFR 50.62 was amended on June 26, 1984 (49 FR 26036). Per the summary section of 49 FR 26036 in the Statement of Considerations (SOC), the purpose of 10 CFR 50.62 was to reduce the likelihood of failure of the reactor protection system (RPS) to shutdown the reactor (scram) following anticipated transients and to mitigate the consequences of ATWS events. DAFAS at Palo Verde serves as a mitigation element to an ATWS event. The SOC in 49 FR 26036 note that while diverse and independent auxiliary feedwater initiation and turbine trip has a highly favorable value/impact for Westinghouse plants, its installation in Combustion Engineering (i.e., Palo Verde design) plants has only a marginal value/impact.

DAFAS is described in Section 7.3.5 of the Palo Verde Updated Final Safety Analysis Report (UFSAR) (Reference 6). Utilizing advancements in PRA risk analysis methods since the implementation of 10 CFR 50.62, the Palo Verde submittal describes that DAFAS is not credited in the plant PRA model and has not been credited to mitigate any accident analyses considered in UFSAR Chapter 6, "Engineered Safety Features" or Chapter 15, "Accident Analyses." In addition, the exemption request detailed that removal of DAFAS had either no or minimal safety impact for all accident initiator categories. Palo Verde's exemption request utilizes advanced

PRA techniques to determine that acceptable plant accident mitigation strategies exist without reliance on the equipment installed to meet the 10 CFR 50.62 requirement for diverse automatic auxiliary feedwater system (AFS) actuation.

The Palo Verde approach is also consistent with the "Exemptions" section of 49 FR 26036, which states in part,

> Some of the older operating nuclear power plants (e.g., those licensed to operate prior to August 22, 1969) may be granted an exemption from these amendments if they can demonstrate that their risk from ATWS is sufficiently low.

While the context of this statement is directed at older nuclear power plants licensed prior to Palo Verde, it's purpose demonstrates that sufficiently low risk from ATWS events is an appropriate avenue for requesting exemptions from 10 CFR 50.62 requirements.

The SOC also describe the lack of plant reliability assurance programs in general, and for the reactor trip system in particular, as a significant impetus for promulgating 10 CFR 50.62. The SOC (49 FR 26036) also include additional comments from Commissioner Roberts echoing the SOC's discussion regarding the lack of a reliability assurance program as an important driver for 10 CFR 50.62. Subsequent to the issuance of the 10 CFR 50.62 in 1984, 10 CFR 50.65 was promulgated in 1991 and amended in 1999. 10 CFR 50.65 required plants to implement a reliability assurance program which 10 CFR 50.62 did not put in place.

Therefore, equipment reliability regulation via implementation of 10 CFR 50.65, as well as advancements in PRA analysis and associated NRC policy and regulatory guidance, have altered the regulatory landscape since promulgation of 10 CFR 50.62 (evaluated further in Section 3.6.1 below). This change in the regulatory landscape provides an appropriate basis for NRC consideration of the Palo Verde exemption request allowing elimination of DAFAS from the plant's licensing basis. The licensee requests the exemption under special circumstances per 10 CFR 50.12(a)(2)(iii) (i.e., undue hardship) and asserts that the exemption represents low risk, is of minimal safety impact, and that adequate defense-in-depth and safety margins are preserved.

3.1 Conformance with RIPE Minimal Safety Impact Criteria

The licensee considered of the RIPE screening questions contained in Sections 4.1 and 4.2 of the NRC "Guidelines for Characterizing the Safety Impact of Issues," (Reference 5) and concluded that the removal of DAFAS would have adverse safety impacts but that these impacts had a minimal impact on safety. Considerations for each of the five screening questions are discussed below.

Attachment 1 of the licensee's submittal demonstrates that the proposed removal of DAFAS from the Palo Verde licensing basis will not result in an adverse impact on the frequency of existing accident initiators or result in new accident initiators, and will result in no adverse safety impacts on the multiple fission product barriers at Palo Verde. The NRC staff reviewed the licensee's consideration of these screening elements and concluded that there is no adverse impact on the frequency of existing accident initiators or creation of new accident initiators as a result of the removal of DAFAS.

In Attachment 1 of the submittal, the licensee states that an adverse impact was identified with respect to the availability, reliability, or capability of structures, systems, and components or

personnel relied upon to mitigate a transient, accident, or natural hazard, specifically that removal of DAFAS removes the availability of diverse automatic AFS actuation if the conditions for actuation were present. However, the licensee's submittal states that DAFAS is diverse and independent from the existing engineered safety features actuation system (ESFAS) initiating circuits for the auxiliary feedwater actuation signal (AFAS) and does not provide an actuation signal to the AFS pump "N." In addition, there are no PRA time sensitive operator actions dependent on manipulation or interaction with DAFAS. Therefore, the licensee's submittal determined that the adverse impact was minimal. This issue is evaluated further in Section 3.6 below.

Attachment 1 of the licensee's submittal states that an adverse impact was identified with respect to the increase in the consequences of a risk significant accident sequence because DAFAS partially mitigates the consequences of an ATWS event. However, the licensee's submittal also states that DAFAS is not credited in the Palo Verde UFSAR Chapter 15, "Accident Analyses" and does not play a role in the limiting dose event in Palo Verde UFSAR Section 15.2.8, "Feedwater System Pipe Breaks." Therefore, dose consequences remain unchanged and are bounded by the feedwater system break accident sequence in UFSAR Section 15.2.8. The NRC staff concludes that the licensee's submittal demonstrates that the identified adverse impact is minimal because removal of DAFAS does not change the most limiting dose event at Palo Verde.

Attachment 1 of the licensee's submittal described an adverse impact on defense-in-depth capability or impact on safety margin due to the removal of DAFAS. The licensee's submittal describes several elements of defense-in-depth in support of the RIPE exemption request, including the reliability of the existing RPS, supplementary protection system (SPS), and ESFAS trips and actuations that will remain in place after the proposed removal of DAFAS from the Palo Verde licensing basis. In addition, the licensee's exemption request describes operator manual actuation of AFS flow as a defense-in-depth measure to preclude a lack of adequate steam generator (SG) inventory and subsequent two-phase flow at the pressurizer safety valves (PSVs) under ATWS conditions where AFS flow is not actuated by AFAS or DAFAS. The licensee's submittal utilizes these elements to demonstrate that the seven considerations of defense-in-depth are preserved as described in Regulatory Guide (RG) 1.174, Revision 3, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Section 2.1.1.2 (Reference 7), with the proposed removal of DAFAS from the Palo Verde licensing basis. Based on these results, the licensee determined that the adverse impacts to defense-in-depth were minimal. These issues are evaluated further in Section 3.6 below.

3.2 Implementation of an IDP

The licensee has been approved to adopt 10 CFR 50.69 by letter dated October 10, 2018 (Reference 9). The licensee established a multi-disciplinary IDP to evaluate the proposed exemption to allow removal of DAFAS from the Palo Verde licensing basis. The IDP membership was comprised of plant engineering, operations, PRA risk analysts, and licensing personnel. Therefore, the NRC staff concludes that Palo Verde utilized an acceptable IDP in support of the proposed exemption request per the RIPE guidance in TSG-DORL-2021-01 (Reference 3). The IDP deliberated the five adverse safety impact screening questions contained in "Guidelines for Characterizing the Safety Impact of Issues" (Reference 5) and concluded that the proposed exemption results in a minimal safety impact. The NRC staff observed the IDP proceedings, and the IDP summary document is included in the licensee's submittal.

3.3 Use of an Acceptable/Approved PRA Model

Palo Verde has adopted risk-informed initiative TSTF 425, as approved by letter dated December 15, 2011 (Reference 10). In addition, the NRC approved the Palo Verde risk-informed completion time license amendments by letters dated May 29, 2019 (Reference 11) and February 10, 2020 (Reference 12), consistent with NEI 06-09, "Risk-Informed Technical Specifications Initiative 4b, Risk-Managed Technical Specifications (RMTS) Guidelines," in lieu of TSTF 505 since at the time the NRC had temporarily suspended approval of TSTF 505. The Palo Verde PRA model used to support the risk-informed completion time program includes internal and external events, fires, and seismic hazards. Subsequently implementation of the TSTF-505 license amendment and license conditions was completed. Therefore, the NRC staff concludes that Palo Verde utilized a technically acceptable PRA model in support of the proposed exemption request per the RIPE guidance in TSG-DORL-2021-01 (Reference 3).

3.4 Evaluation of PRA Results

The Palo Verde PRA model does not include credit for DAFAS. Therefore, the licensee modeled the structures, systems, and components associated with AFAS as always reliable in the PRA as a surrogate to determine the maximum possible risk benefit of DAFAS. The reduction in risk between the baseline PRA results and the results with AFAS always reliable was 5.0×10^{-9}/year CDF and 1.4×10^{-10}/year LERF. This risk reduction represents the maximum possible risk increase that could result from failure or removal of DAFAS, if it were modeled in the PRA. These results satisfy the RIPE criteria of contributing less than 1×10^{-7}/year to CDF and 1×10^{-8}/year to LERF. The addition of the maximum possible increase in risk due to failure or removal of DAFAS does not alter the Palo Verde baseline risk of 5.5×10^{-5}/year for CDF and 9.5×10^{-6}/year for LERF. Therefore, cumulative risk for Palo Verde remains less than the RIPE criteria of 1.0×10^{-4}/year for CDF and 1.0×10^{-5}/year for LERF. The NRC staff concludes that these results satisfy the RIPE criteria in TSG-DORL-2021-01 (Reference 3) for a minimal increase in risk for the proposed exemption to allow removal of DAFAS from the Palo Verde licensing basis.

3.5 Evaluation of the Need for Risk Management Actions

Evaluation of the RIPE screening questions discussed in Section 3.1 above, and the PRA results discussed in Section 3.4 above, confirm that the proposed exemption results in a minimal safety impact. Therefore, the guidance in TSG-DORL-2021-01 (Reference 3) states that risk management actions should be considered. In Section 4.3 of the submittal, the licensee states that no risk management actions are required to offset the risk increase. The NRC staff concludes that removal of DAFAS does not alter the mitigation of an ATWS event as modeled in the plant PRA and no risk management actions were identified or determined to be required.

3.6 Evaluation of Safety Margin and Defense-in-Depth

The licensee determined that application of the RIPE screening questions contained in Sections 4.1 and 4.2 of the NRC "Guidelines for Characterizing the Safety Impact of Issues" (Reference 5) resulted in identified adverse impacts but that these impacts result in only a minimal impact on safety and that adequate safety margin remains. DAFAS is a defense-in-depth system installed to meet the requirements of 10 CFR 50.62(c)(1). The NRC staff

reviewed the identified adverse impacts on defense-in-depth when DAFAS is removed from the licensing basis, and as discussed below finds this results in a minimal impact on safety.

3.6.1 Implementation of 10 CFR 50.65

Section 2.2 of the licensee's exemption request describes three safety-grade systems installed at Palo Verde that would initiate a reactor scram, a turbine trip and initiate the AFS. These three systems comprise the plant protection system at Palo Verde:

- RPS initiates a reactor trip.
- ESFAS generates automatic AFASs.
- SPS initiates a reactor trip utilizing trip logic that is independent and diverse from the RPS trip logic. SPS also provides the input (i.e., interrupts power to the control element drive mechanism coils) that results in the DTT initiation of a turbine trip. The DTT is a control-grade system and is unaffected by the requested exemption.

The RPS and ESFAS systems provide primary initiation of a reactor trip and the AFAS was already installed when 10 CFR 50.62 was implemented requiring diverse actuation of these existing primary initiation functions. However, as described above, the SOC associated with 10 CFR 50.62 described the lack of plant reliability assurance programs in general, and for the reactor trip system in particular, as a significant impetus for promulgating 10 CFR 50.62 as discussed in Section 3.0 above. The RPS and ESFAS are now monitored under the requirements of 10 CFR 50.65, which was promulgated subsequent to 10 CFR 50.62.

The SPS provides the diverse reactor trip required by 10 CFR 50.62 and is installed as a safety-grade system, exceeding the requirements of 10 CFR 50.62, and is monitored under 10 CFR 50.65. As noted above, the DTT is a control-grade system and is unaffected by the requested exemption.

Implementation of 10 CFR 50.65 addresses the lack of a reliability assurance program that was a driving factor for promulgating 10 CFR 50.62. Therefore, the NRC staff concludes that monitoring of safety-grade and nonsafety-grade systems scoped into the 10 CFR 50.65, including RPS, ESFAS and SPS, provides a significant element of reliability not present when 10 CFR 50.62 was promulgated.

3.6.2 Deterministic Safety Margin Evaluations

The licensee's submittal described a deterministic computer code engineering evaluation performed to assess the most limiting effect on the plant of no automatic actuation of AFS flow. The scenario evaluated by the licensee was a beyond design basis case of a loss of normal feedwater (LONF) flow coincident with an SPS reactor trip actuated on high-high pressurizer pressure. No AFAS actuation was assumed to occur for the evaluation. This beyond design basis LONF scenario was evaluated with DAFAS initiating AFS flow and again without DAFAS initating AFS flow .

The scenarios evaluated by the licensee demonstrate that peak reactor coolant system (RCS) pressure is reached early in the event whether or not DAFAS is actuated. The peak RCS pressure for the LONF scenarios was determined to be the same regardless of the timing of AFS flow reaching the SGs. Furthermore, the peak RCS pressure (2624 pounds per square-

inch absolute (psia)) remained bounded by the Palo Verde UFSAR Chapter 15 limiting event (loss of condenser vacuum combined with a single failure) RCS peak pressure of 2745 psia. The LONF beyond design basis case scenario without DAFAS actuation of AFS flow to the SGs also remains below the Palo Verde Technical Specification 2.1.2 RCS Safety Limit of 2750 psia.

The NRC staff concludes that selection of the UFSAR Chapter 15.2.7 LONF case is appropriate as it evaluates the sequence of events (i.e., closure of the feedwater control valves) that would result in the need for DAFAS actuation of AFS flow. The design basis case was also appropriately altered to remove actuation of AFS flow by either DAFAS or AFAS to assess the effects of no feedwater flow to the SGs during the transient providing a conservative analysis of the requested exemption. Therefore, the NRC staff concludes that the licensee's analyses capture the thermal hydraulic and plant systems impact of a failure of DAFAS to automatically initiate AFS flow to the SGs and demonstrate that adequate safety margin remains.

However, the beyond design basis LONF initiating event coincident with an SPS trip without AFAS or DAFAS actuation (i.e., no AFS flow) also results in the potential for a lack of adequate SG inventory and two-phase flow at the PSVs to achieve mitigation of the transient. Conditions of two-phase flow through the PSVs are to be avoided as they are qualified to pass saturated steam. Two-phase flow has the potential for PSV malfunctions, excessive valve blowdown, and excessive loss of RCS inventory. The licensee's exemption request describes operator manual actuation of AFS flow as a defense-in-depth measure to preclude a lack of adequate SG inventory and subsequent two-phase flow at the PSVs under ATWS conditions where SPS initiates a reactor trip and AFS flow is not actuated by AFAS or DAFAS. The reliability and feasibility of this operator manual action are evaluated below in Section 3.6.3.

3.6.3 Human Factors Review

3.6.3.1 Description of the Operator Manual Action

The licensee's supplemental letter dated February 22, 2022, described analyses that determined a lack of adequate SG inventory condition at 645 seconds after the start of a beyond design basis LONF initiating event coincident with an SPS reactor trip and no AFAS actuation. This 645-second time represents the total time available for operators to manually actuate AFS flow during the transient to avoid a lack of adequate SG inventory. The licensee's submittal describes the operator actions as being performed utilizing existing control room plant indications and controls, and existing plant procedures. No changes in the human-system interface are involved. Human factors considerations are evaluated commensurate with the safety significance of the issue as described in RG 1.174, Revision 3, Section 2.1.1.4, "Integrated Evaluation of the Defense-in-Depth Considerations," such that the proposed change impact is evaluated both risk and traditional engineering perspectives.

The NRC staff reviews the human performance aspects of licensing action requests utilizing guidance in NUREG-1764, Revision 1, "Guidance for the Review of Changes to Human Actions" (Reference 8). NUREG-1764, Appendix A, Table A.2, "Generic PWR [Pressurized Water Reactor] Human Actions That Are Risk-Important," provides two groupings of human actions: "Group 1: PWR Human Actions That Are Risk-Important," and "Group 2: PWR Potentially Risk-Important Human Actions." Group 2 includes "Actions in response to ATWS," indicating a Level I (high risk) or Level II (medium risk) human factors review with the possibility of reduction to a Level III (low risk) review, if appropriate.

As discussed in Section 3.1 above, the proposed exemption request is characterized as low risk significant and of minimal safety impact associated with RIPE criteria guidance in Reference 3. Additionally, the proposed operator manual action is considered in the context of the exemption request as a credited element of integrated defense-in-depth rather than a credited human action in lieu of an automatic action to meet the requirements of 10 CFR 50.62(c)(1). Therefore, a Level II human factors review is considered more appropriate than a Level I review. Additional application of the screening criteria contained in Section 2.3, "Screening Process for Risk-Informed Change Requests," of NUREG-1764 may indicate a further reduction in the level of human factors review from Level II to Level III. However, given the prominence of the manual operator action within the integrated defense-in-depth strategy, the NRC staff determined that the human factors review will remain at Level II per Section 4 of NUREG-1764.

3.6.3.2 General Deterministic Review

Per Section 3.6.3.1 above, the deterministic analyses described in the exemption request supplement determined that there was a 645-second time to a potential lack of adequate SG inventory based on the LONF beyond design basis case without DAFAS automatic actuation of AFS flow to the SGs. The NRC staff concluded in Section 3.6.2 above that the licensee's analyses capture the thermal hydraulic and plant systems impact of a failure of DAFAS to automatically initiate AFS flow to the SGs under ATWS conditions where SPS initiates a reactor trip and these analyses therefore demonstrate that adequate safety margin remains.

While the analyses showed that peak RCS pressure is reached early in the event, and the plant systems operate to maintain RCS pressure within design and TS limits, a potential lack of adequate SG inventory and two-phase flow at the PSVs result during the course of mitigating the transient. Conditions of two-phase flow through the PSVs are to be avoided as they are only qualified to pass saturated steam. Two-phase flow has the potential for PSV malfunctions, excessive valve blowdown, and excessive loss of RCS inventory. Therefore, the licensee's exemption request describes operator manual actuation of AFS flow as an additional defense-in-depth action to preclude a lack of adequate SG inventory and subsequent two-phase flow at the PSVs under ATWS conditions where SPS initiates a reactor trip and AFS flow is not actuated by AFAS or DAFAS. The licensee's submittal described traditional human factors activities such as training, procedures, and operator action validation. All of these human factors engineering activities provide additional evidence that the defense-in-depth manual actions can be performed as described.

3.6.3.3 Design of Human-System Interfaces, Procedures, and Training

Per Enclosure Attachment 1, Step 2, item 5 of the licensee's submittal, control room operators are trained to enter Procedure 40EP-9EO01, "Standard Post Trip Actions," when initiating or receiving a reactor trip. In addition to specifying the immediate actions that must be accomplished subsequent to an automatically or manually initiated reactor trip, Procedure 40EP-9EO01 also includes diagnostic actions necessary to determine a preliminary diagnosis of an event such as loss of all feedwater. Implementation of these procedurally driven diagnostic actions was demonstrated via crew time validation runs as discussed in Sections 3.6.3.4 and 3.6.3.5 below.

Procedure 40EP-9EO01 is a plant operating procedure and therefore, maintained in accordance with plant procedure controls and is utilized/re-enforced in operating crew training activities. Implementation of Procedure 40EP-9EO01 is performed utilizing the existing control room plant indications and controls, and no changes in the human-system interface are involved. In

addition, the procedurally directed actions are accomplished with the normal compliment of control room staffing.

Based on the licensee's description of operator immediate and diagnostic actions contained in Procedure 40EP-9EO01, the NRC staff concludes that the licensee's reliance on Procedure 40EP-9EO01 to provide procedurally directed operator actions to manually actuate AFS flow without AFAS or DAFAS automatic actuations during conditions with the potential to produce an ATWS supports the feasibility and reliability of the operator actions.

3.6.3.4 Human Action Verification

The licensee's exemption request described crew simulation runs conducted to verify the operator actions associated with manual actuation of the AFS flow to the SGs under potential ATWS conditions. The control room simulations were structured such that a LONF initiating event occurred due to a simultaneous trip of both main feedwater pumps and the AFAS and DAFAS failure to automatically actuate. In addition, all automatic RPS trips were prevented. Automatic trip initiations via the diverse scram system/supplementary protection system (RCS high trip at greater than 2409 psia) remained enabled as well as the capability of a manual reactor trip via Control Room Board 05.

Two separate operating crews participated in the simulation runs. The operating crews comprised the normal compliment of three qualified reactor operators, a control room supervisor, a shift technical supervisor, and a shift manager. The simulator validation crews were not given advance knowledge of the scenario. Both crews identified the transient and manually tripped the reactor within 30 seconds before the RPS SG low level trip setpoint (which was disabled and would not have tripped the reactor), precluding an ATWS. One crew established AFS flow in 220 seconds and the other crew in 110 seconds. Further analysis of the crew validation simulator verifications is discussed in Section 3.6.3.5 below.

3.6.3.5 Analysis

The two separate normally staffed crews that participated in the transient simulation both acted with appropriate controls. Both crews successfully manually actuated AFS to the SGs well within the 645-second time limit. The first crew accomplished manual actuation of AFS in 220 seconds and the second in 110 seconds, reflecting a margin of 66 percent and 83 percent, respectively. The difference in performance between the two crews is due to a plant indication cue that was recognized by the crew with the 110-second validation time, but not by the crew with the 220-second validation time, specifically, the exceedance of the AFAS actuation setpoint.

The crew time validation simulator runs demonstrate that even if a crew fails to recognize the indication cue that the AFAS actuation setpoint has been exceeded, AFS flow to the SGs was still accomplished with a margin of at least 66 percent with respect to the analytically determined time limit of 645 seconds. Therefore, the NRC staff concludes that the licensee has demonstrated that the operator actions to manually initiate AFS flow without DAFAS to preclude a lack of adequate SG inventory and two-phase flow at the PSVs during the course of mitigating a potential ATWS condition are feasible and reliable.

3.6.3.6 Human Factors Review Conclusion

The NRC staff has reviewed the licensee's inclusion of operator actions to manually initiate AFS flow without DAFAS automatic actuation as an additional element of defense-in-depth in support of the RIPE exemption request. The NRC staff's human factors review concludes that the described operator actions are procedurally driven, involve no new human-system interfaces, and no additional staffing requirements. In addition, the licensee has described crew simulation runs that the NRC staff has reviewed and determined provide appropriate human action verification and operator action margin. Therefore, the NRC staff concludes that the manual operator actions are feasible and reliable to provide a defense-in-depth measure in support of the licensee's exemption request.

3.6.4 Integrated Defense-in-Depth Conclusion

Enclosure Attachment 1, Step 2, item 5 of the licensee's submittal includes several elements of defense-in-depth in support of the RIPE exemption request. These elements include the reliability of the existing RPS, SPS, and ESFAS trips and actuations that will remain in place after the proposed removal of DAFAS from the Palo Verde licensing basis. The reliability of these systems has been elevated and enhanced with the implementation of the Maintenance Rule subsequent to the implementation of the ATWS Rule. (See Section 3.6.1 above.) The licensee's submittal utilizes these elements to demonstrate that the seven considerations of defense-in-depth are preserved as described in RG 1.174, Revision 3, Section 2.1.1.2, with the proposed removal of DAFAS from the Palo Verde licensing basis.

The NRC staff concludes that the licensee's submittal has demonstrated that the RPS, ESFAS/AFAS, and SPS are designed and maintained with high reliability and are monitored under the Maintenance Rule. The NRC staff determined that defense-in-depth for the proposed exemption and actions, requires timely, alternate means of establishing auxiliary feedwater to the SGs following an ATWS. The licensee's exemption request describes operator manual actuation of AFS flow to preclude a lack of adequate SG inventory and subsequent two-phase flow at the PSVs under ATWS conditions where AFS flow is not actuated by AFAS or DAFAS. The manual operator actuation of AFS will not be credited in lieu of automatic actuation of DAFAS to meet the requirements of 10 CFR 50.62(c)(1), rather, the licensee has credited existing operator manual actions within existing emergency operating procedures to initiate AFS under ATWS conditions where AFS flow is not actuated by AFAS or DAFAS as defense-in-depth in support of the requested exemption. The NRC staff has evaluated and concluded that these manual operator actions are feasible and reliable as a defense-in-depth measure and that the licensee's submittal demonstrates that the seven considerations of defense-in-depth are preserved as described in RG 1.174, Revision 3, Section 2.1.1.2. Therefore, the NRC staff concludes that adequate defense-in-depth will be preserved with the removal of DAFAS from the Palo Verde licensing basis.

3.7 Adherence to 10 CFR 50.12 Requirements

The partial exemption to the requirement in 10 CFR 50.62(c)(1) to provide equipment to automatically initiate the auxiliary (or emergency) feedwater system under ATWS conditions that is diverse for the reactor trip system at Palo Verde, satisfies the requirements of 10 CFR 50.12 as described below:

(1) *The exemption is authorized by law.* NRC has the authority under 10 CFR 50.12 to grant exemptions from the requirements of Part 50 upon demonstration of proper justification. The licensee has requested a partial exemption to the requirement in 10 CFR 50.62(c)(1) to provide equipment to automatically initiate the auxiliary (or

emergency) feedwater system under ATWS conditions that is diverse from the reactor trip system. The licensee will continue to meet all other requirements in 10 CFR 50.62(c)(1). As discussed below, the NRC staff determined that special circumstances exist, which support granting the proposed exemption. Furthermore, granting the exemption would not result in a violation of the Atomic Energy Act of 1954, as amended, or the NRC's regulations. Therefore, the exemption is authorized by law.

(2) *The exemption will not present an undue risk to public health and safety.* As described above in Section 3.0, the NRC staff has concluded that the exemption represents low risk, is of minimal safety impact, and that adequate defense-in-depth and safety margins are preserved. DAFAS is not credited in the Palo Verde UFSAR Chapters 6 and 15 accident analyses for actuating AFS to remove residual heat. AFAS is the credited means for initiating AFS in the UFSAR analyses as well as in the Palo Verde PRA model and will be unaffected by the proposed removal of DAFAS. In addition, the NRC staff has concluded that it is acceptable for the licensee to credit existing operator manual actions within the emergency operating procedures to initiate AFS under ATWS conditions as defense-in-depth in support of the requested exemption. Thus, granting this exemption request will not pose undue risk to public health and safety.

(3) *The exemption is consistent with the common defense and security*. The proposed exemption will allow the licensee to allow removal of DAFAS from the Palo Verde licensing basis as a diverse automatic actuation of AFS under ATWS conditions satisfying partial requirements of 10 CFR 50.62(c)(1). The NRC staff has evaluated and concluded that the licensee's submittal demonstrates that the RPS, ESFAS/AFAS, and SPS are designed and maintained with high reliability and are monitored under the Maintenance Rule. The NRC staff also concluded that adequate defense-in-depth and safety margins will be preserved with the removal of DAFAS from the Palo Verde licensing basis. The licensee will continue to meet all other requirements in 10 CFR 50.62(c)(1). Further, the exemption does not involve security requirements and does not create a security risk. Therefore, the exemption is consistent with the common defense and security.

(4) *Special circumstances are present.* The licensee has asserted that continuing to maintain DAFAS in the plant licensing basis represents an undue hardship in accordance with 10 CFR 50.12(a)(2)(iii) due to its obsolescence. DAFAS is no longer supported by the vendor and spare parts are not readily available for the system. Significant engineering resources are required to reverse-engineer parts and frequent fiber optic communications problems often affect DAFAS system reliability. DAFAS operates on a vendor-supplied proprietary platform that is unique to Palo Verde. The vendor is no longer in business and Palo Verde can no longer obtain the Modicon programmable logic controllers, displays and associated equipment to maintain DAFAS. Since these replacement parts can no longer be obtained through generally available sources, the licensee has established that maintaining or replacing DAFAS in the given circumstances is a hardship. Furthermore, the SOC associated with 10 CFR 50.62(c)(1) (49 FR 26038, dated June 26, 1984) state that the installation of diverse equipment to trip the turbine and initiate auxiliary feedwater have only a marginally favorable value/impact for Combustion Engineering plants such as Palo Verde. In addition, the NRC staff has concluded that the licensee has demonstrated that removal of DAFAS from the Palo Verde licensing basis represents low risk and only a minimal safety impact. Therefore, the maintaining or replacing DAFAS in the given circumstances is an undue hardship on the licensee. For these

reasons, granting an exemption to allow removal of DAFAS from the Palo Verde licensing basis supports the claimed special circumstance of undue hardship.

4.0 ENVIRONMENTAL CONSIDERATIONS

The exemption requested by the licensee includes changes to requirements with respect to installation or use of a facility component located within the restricted area. The NRC staff determined that the exemption meets the eligibility criteria for the categorical exclusion set forth in 10 CFR 51.22(c)(9) because the granting of this exemption involves: (i) no significant hazards consideration, (ii) no significant change in the types or a significant increase in the amounts of any effluents that may be released offsite, and (iii) no significant increase in individual or cumulative occupational radiation exposure. Therefore, in accordance with 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the NRC's consideration of this exemption request. The basis for the NRC staff's determination of each of the requirements in 10 CFR 51.22(c)(9) is discussed below.

Requirements in 10 CFR 51.22(c)(9)(i)

The NRC staff evaluated the issue of no significant hazards consideration using the standards described in 10 CFR 50.92(c), as presented below:

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

   Response: No.

   The licensee's submittal notes that DAFAS is not credited in the UFSAR Chapter 15 accident analyses and does not play a role in the limiting dose event in Section 15.2.8, "Feedwater System Pipe Breaks." Therefore, dose consequences remain unchanged and are bounded by the feedwater system break accident sequence in UFSAR Chapter 15.2.8. In addition, while accident consequences are typically quantified in terms of public dose, the licensee's submittal notes that the SOC associated with the ATWS Rule (46 FR 57524, dated November 24, 1981) state that licensees are not required to calculate potential offsite radiological doses resulting from an ATWS event under 10 CFR 100.11, "Determination of exclusion area, low population zone, and population center distance."

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

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

   Response: No.

   The impact on the frequency of, or creation of new, accident initiators in relation to DAFAS would be represented by an inadvertent actuation of feedwater resulting in an increase in feedwater flow to the SGs as analyzed in the Palo Verde UFSAR Chapter 15.1.2, "Increase in Main Feedwater Flow." However, removal of DAFAS from the Palo Verde licensing basis would allow for a lower probability of the occurrence of

this accident initiator. Should DAFAS remain operational or installed in the plant, adherence to the Maintenance Rule for the ESFAS/AFAS and AFS will require that any system boundary issues that could result in an inadvertent actuation of AFS be addressed per 10 CFR 50.65(b)(2)(iii).

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

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

Response: No.

DAFAS is a defense-in-depth system installed to meet the requirements of 10 CFR 50.62(c)(1). The licensee's submittal describes several elements of defense-in-depth in support of the exemption request. These elements include the reliability of the existing RPS, SPS, and ESFAS trips and actuations that will remain in place after the proposed removal of DAFAS from the Palo Verde licensing basis. The reliability of these systems has been elevated and enhanced with the implementation of the Maintenance Rule (10 CFR 50.65) subsequent to the implementation of the ATWS Rule. In addition, the licensee's exemption request describes operator manual actuation of AFS flow as a defense-in-depth measure to preclude a lack of adequate SG inventory and subsequent two-phase flow at the PSVs under ATWS conditions where AFS flow is not actuated by AFAS or DAFAS. The licensee's submittal utilizes these elements to demonstrate that the seven considerations of defense-in-depth are preserved as described in RG 1.174, Revision 3, Section 2.1.1.2, with the proposed removal of DAFAS from the Palo Verde licensing basis and supports that the adverse impact to defense-in-depth is minimal.

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

Based on the above, the NRC staff concludes that the proposed exemption presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of no significant hazards consideration is justified (i.e., satisfies the provision of 10 CFR 51.22(c)(9)(i)).

Requirements in 10 CFR 51.22(c)(9)(ii)

DAFAS is not credited in the Palo Verde UFSAR Chapter 15 accident analyses and does not play a role in the limiting dose event in Section 15.2.8, "Feedwater System Pipe Breaks." The proposed exemption allowing removal of DAFAS from the Palo Verde licensing basis will not significantly change the types or amounts of effluents that may be released offsite. Therefore, the provision of 10 CFR 51.22(c)(9)(ii) is satisfied.

Requirements in 10 CFR 51.22(c)(9)(iii)

The licensee's exemption request detailed that removal of DAFAS had either no or a minimal safety impact for all accident initiator categories and the NRC staff has concluded that the proposed removal of DAFAS from the Palo Verde licensing basis will not result in an adverse impact on the frequency of existing accident initiators or result in new accident initiators. The proposed exemption to allow the removal of DAFAS from the Palo Verde licensing basis will not

significantly increase individual occupational radiation exposure, or significantly increase cumulative public or occupational radiation exposure. Therefore, the provision of 10 CFR 51.22(c)(9)(iii) is satisfied.

Based on the above, the NRC staff concludes that the proposed exemption meets the eligibility criteria for the 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 NRC's proposed issuance of this exemption.

5.0 CONCLUSIONS

Based on the NRC staff's regulatory and technical evaluation of the proposed exemption request, as documented above, the staff concludes that (1) the proposed removal of DAFAS from the Palo Verde licensing basis is acceptable, and (2) the special circumstance of undue hardship associated with maintaining DAFAS is supported under the proposed exemption. Therefore, the NRC staff concludes that, pursuant to 10 CFR 50.12(a), the proposed exemption allowing removal of DAFAS from the licensing basis at Palo Verde is acceptable.

6.0 REFERENCES

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2. Harbor, C. D., APS, letter to U.S. Nuclear Regulatory Commission, "Palo Verde Nuclear Generating Station Units 1, 2, and 3 Docket Nos. STN 50-528, 50-529, and 50-530 Renewed Operating License Number NPF-41, NPF-51 and NPF-74 Response to Requests for Confirmation of Information for Exemption from Certain Requirements of 10 CFR 50.62(c)(1) using Risk-Informed Process for Evaluations," dated February 22, 2022 (ADAMS Accession No. ML22053A212).

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4. Nuclear Energy Institute, "NEI Guidelines for the Implementation of the Risk-Informed Process for Evaluations Integrated Decision-Making Panel," dated August 2020 (ADAMS Accession No. ML20245E147).

5. U.S. NRC Regulatory Commission "Guidelines for Characterizing the Safety Impact of Issues," Revision 1, dated June 2021 (ADAMS Accession No. ML21180A014).

6. Palo Verde Nuclear Generating Station, Units 1, 2, and 3, Updated Final Safety Analysis Report, Revision 21 (ADAMS Accession No. ML21201A262, Package: ADAMS Accession No. ML21201A312).

7. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.174, Revision 3, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-

Specific Changes to the Licensing Basis," dated January 2018 (ADAMS Accession No. ML17317A256).

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9. Orenak, M. D., letter to APS, "Palo Verde Nuclear Generating Station, Units 1, 2, and 3 – Issuance of Amendment Nos. 207, 207, and 207, to Adopt 10 CFR 50.69, 'Ris-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors'," dated October 10, 2018 (ADAMS Accession Number ML18243A280).

10. Gibson, L. K., letter to APS, "Palo Verde Nuclear Generating Station, Units 1, 2, and 3 – Issuance of Amendments RE: Adoption of TSTF-425, Revision 3, 'Relocate Surveillance Frequencies to Licensee Control – RITSTF initiative 5B'," dated December 15, 2011 (ADAMS Accession No. ML112620293).

11. Lingam, S.P., letter to APS, "Palo Verde Nuclear Generating Station, Units 1, 2, and 3 – Issuance of Amendment Nos. 209, 209, and 209 RE: Adoption of Risk-Informed Completion Times in Technical Specifications,", dated May 29, 2019 (ADAMS Accession No. ML19085A525).

12. Lingam, S.P., letter to APS, "Palo Verde Nuclear Generating Station, Units 1, 2, and 3 – Issuance of Amendment Nos. 211, 211, and 211 to Extend Implementation Date for Amendment Nos. 209, 209, and 209 Associated with Initiative 4b that Permit the Use of Risk-Informed Completion Times on the Technical Specifications," dated February 10, 2020 (ADAMS Accession No. ML20016A458).

13. Technical Specifications Task Force, Transmittal of TSTF-505, Revision 1, "Provide Risk-Informed Extended Completion Times - RITSTF Initiative 4b Errata," dated June 14, 2011, and "Proposed Revision to the Model Application for TSTF-505, Revision 1, 'Provide Risk-Informed Extended Completion Times - RITSTF Initiative 4b,'" dated January 31, 2012 (ADAMS Package Accession No. ML120330410).

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