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Subject: **Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2, and 3 Docket Nos. STN 50-528/529/530
Program Review - Simulator Testing Methodology**

This letter from Arizona Public Service (APS) serves to provide information and clarification concerning the Palo Verde Nuclear Generating Station (PVNGS) simulator testing strategy and methodology to the Nuclear Regulatory Commission (NRC), as requested by the NRC licensed operator examination inspection team.

ANSI/ANS 3.5-1985 and 10 CFR 55.46, Simulation facilities, are specific to single simulator simulation facilities. PVNGS has two – Unit 1 plant-referenced full-scope simulators.

Currently, guidance does not specifically address instances where utilities possess multiple identical plant reference simulators. The enclosure to this letter provides the APS position that the existing testing strategy, based upon the previous inspections, industry precedence, and demonstrated history of quality simulator training and operator testing, is consistent with the intent and objectives of the guidance.

No commitments are being made to the NRC by this letter.

If you have any questions or require additional information, please contact Jarred Shaver, Section Leader Nuclear Training, at (623) 393-4519.

Sincerely,

A handwritten signature in black ink, appearing to read "C.D. Harbor", written over a horizontal line.

Cary Harbor
Vice President, Nuclear Regulatory & Oversight

CDH/JS

Enclosure: Simulator Testing Methodology

Enclosure

Simulator Testing Methodology

During the 2022 NRC 71111.11 Inspection, which occurred the week of September 26, 2022, at the Palo Verde Generating Station (PVNGS), questions were raised by the inspection team related to the Palo Verde simulator testing methodology. During the inspection, the NRC informed PVNGS leadership that the inspection team was planning to exit with an Unresolved Regulatory Issue (URI) and was going to hold the inspection open pending the URI closure. The potential URI pertained to the training simulator testing process alignment with Regulatory Guide 1.149, Revision 1 and ANSI/ANS 3.5-1985, *American National Standard for Nuclear Power Plant Simulators*. Palo Verde simulator testing is controlled through site procedure 15DP-OTR70, *Simulator Configuration*, Revision 7, and permits simulator malfunction testing to be performed on a single simulator and credited for both plant reference simulators. Regulatory Guide 1.149, Revision 1 and ANSI/ANS 3.5-1985 do not contain guidance for stations with two identical plant reference simulators. On November 11, 2022, the 71111.11 exit meeting occurred with the Lead Inspector, Mr. Nick Hernandez. During the formal exit meeting PVNGS Management was notified that the URI was closed, and no findings were identified.

Regulatory Background Information

10 CFR 55.46¹, Simulation facilities, is the regulation governing the use of simulators in the licensed operator examination process. ANSI/ANS 3.5-1985 was created by an industry working group with the intent of providing a standard that would meet the simulator requirements of the NRC while addressing the needs of the industry. Regulatory Guide 1.149, Revision 1, was the response by the NRC to the ANSI/ANS 3.5-1985 standard. It describes acceptable methods for complying with regulations for plant-referenced simulators and provides guidance on alternative ways to meet ANSI/ANS-3.5-1985. Regulatory Guide 1.149, Revision 1, is the guide intended to clarify the 1985 standard as there are multiple ANSI standards, each with their own applicable revision of the regulatory guide. Neither ANSI/ANS-3.5-1985 nor Regulatory Guide 1.149, Revision 1, specifically address instances where utilities possess multiple *identical* plant reference simulators.

History of Related Inspections and Related Events

1993 – PVNGS commissions two plant-reference simulators

2004 – 71111.11 Inspection identified the PVNGS rotational simulator testing scheme^{2,3}.

2011 – Oconee Nuclear Station and the NRC corresponded about their “Testing Plan and Testing Credit” scheme after commissioning a second plant reference simulator⁴.

2022 – 71111.11 Inspection. No findings or violations of more than minor were identified during this inspection⁵.

Simulators at PVNGS

PVNGS has three, nearly identical operating units with a common license and two identical full scope training simulators that are referenced to Unit 1. Both plant-reference simulators, Simulator A and Simulator B, were commissioned in 1993. The initial commission testing and continuing testing program

¹ Title 10, Code of Federal Regulations, Part 55, “Operators’ Licenses–, 55.46 Simulation facilities, <https://www.nrc.gov/reading-rm/doc-collections/cfr/part055/full-text.html#part055-0046>.

² IR 05000528/2004-015; 05000-529/2004-015; 05000-529/2004-015; August 30 - September 2, 2004; Palo Verde Nuclear Generating Station, Units 1, 2, and 3: Licensed Operator Requalification Program.

³ ML043380359, NRC Requalification Inspection Report 05000528/2004-015; 05000529/2004-015, 05000530/2004-015

⁴ ML11138A283, ML11138A288, and ML11138A291.

⁵ ML23026A308, Palo Verde Nuclear Generating Station – Integrated Inspection Report 05000528/2022004 and 05000529/2022004 and 05000530/2022004

were established to comply with ANSI/ANS-3.5-1985. The PVNGS simulator testing program is controlled through procedure 15DP-OTR70, *Simulator Configuration*⁶. Both simulators are maintained through a common hardware maintenance program and share an issue tracking system. The simulator training load is comprised of a robust modeling software that runs on the servers and interacts with peripheral systems. The simulator modeling code is managed through a common software configuration control program and the peripheral system configuration is administratively controlled. The Simulator Information Technology (IT) network is configured to allow each simulator server to operate independently (for examinations) or is connected to allow simulator training load pushes from the common software configuration control software. In practice, software issues are resolved, tested, and incorporated into a common development load. During planned load changes, the development load becomes the approved training load when it is transferred out to servers in Simulator A and B.

The Palo Verde simulators are modified as needed as part of the plant modification process. Standard practice is to install significant modifications in one-of-the-two simulators as the modification is installed in the first operating unit. The newly installed plant modification is tracked as a difference from the reference unit, as applicable. When a significant plant modification is installed in all three units, the other simulator is modified. If a modification affects the simulator testing such that test results in one simulator differ from the other simulator, administrative controls ensure the affected tests are performed in *both* plant-reference simulators⁷.

Simulator Testing Strategy

In 2004, the NRC conducted a routine inspection of the Licensed Operator Requalification Program in which a ‘minor’ finding with no associated enforcement action was identified related to simulator performance testing. The NRC Inspection team’s concern stemmed from alignment to Regulatory Guide 1.149, Revision 1. The regulatory position stated in Regulatory Guide 1.149, Revision 1, section C.5 states:

“Plant Malfunctions should be periodically tested to ensure the continued acceptability of the simulation facility. These malfunctions, if applicable to the facility, should be tested in their entirety not less than every four years, approximately 25% per year.”

The inspection team reasoned that by performing malfunction testing on a 4-year test cycle, 25 percent of the malfunction tests are performed on one of the simulators, and in the second year of a 4-year test cycle the next 25 percent of malfunction tests are performed on the other simulator. Thus, 50 percent of the malfunction tests are potentially never run on a specific physical simulator in a particular 4-year span.

Testing Year	Simulator
Odd	A
Even	B

Table 1: Simulator A and B Test Plan⁸

In 2004, PVNGS management generated CRDR 2745719⁹ to evaluate the simulator testing concerns prior to final outcomes of the 71111.11 inspection. The documented actions indicate that this corrective

⁶ 15DP-OTR70, Simulator Configuration, Revision 7.

⁷ 15DP-OTR70, Simulator Configuration, Revision 7, Step 4.7.14.B.

⁸ 15DP-OTR70, Simulator Configuration, Revision 7, Step 4.7.14.A.1.

⁹ CRDR 2745719, CRDR Documents Concerns with the Way the Simulators Are Performance Tested, (2004).

action was downgraded to not adverse to quality based upon telephonic conversations with the NRC that specifically states, “No formal correspondence was required to be submitted.”

“This CRDR should be changed to Review. The CRDR was initially written as Adverse based on an NRC inspection follow-up phone conversation when they stated they were taking exception to Palo Verde’s simulator testing methods.”

The NRC concluded the 2004 inspection and determined that this situation was acceptable, considering that there are no model differences, and only minute differences between the physical simulator hardware. In the finding description of section 1R11 of the associated inspection report¹⁰, the NRC described its assessment of splitting malfunction testing over a 4-year period:

“The inspectors found that the combined testing of the model was complete even though split between the two simulators. This test scheme, while not typical for implementing the ANSI/ANS-3.5 requirements would be acceptable as long as the licensee certified that the hardware configurations did not differ significantly between the simulators.”

Industry Perspective

In the first quarter of 2010, the Oconee Nuclear Site communicated via letter to the NRC¹¹ that it had completed construction and testing of a second full scope simulator, which was essentially identical to its first simulator. This letter also outlined the Oconee Test Plan and Test Credit strategy for two plant-reference simulators. In the letter, “Annual Testing” credit is accepted for *both* simulators based upon a rotation testing scheme and closely monitoring, documenting, and controlling differences between simulators. The NRC Program office made no objection the Oconee simulator facility performance testing scheme¹². Oconee simulators are tested with ANSI/ANS-3.5-1998 and PVNGS Simulators with ANSI/ANS-3.5-1985. In the development of Palo Verde’s current simulator configuration control procedure and testing strategy, the Oconee letter and the NRC’s response to it; as well as the results of NRC inspections of Palo Verde’s simulators were considered. PVNGS considered its circumstances to be similar enough to Oconee’s and believed this to be supported by correspondence with the NRC through its inspection process to the effect that the testing strategy has remained unaltered since before that 2004 inspection and was formally incorporated by station procedures.

Desired Outcome

Presently ANSI/ANS 3.5-1985 and 10 CFR 55.46, Simulation facilities, requirements are specific to single simulator simulation facilities. APS has two Palo Verde Unit 1 referenced full scope functionally equivalent simulators. It is the APS position that the existing testing strategy, based upon the previous inspections, industry precedence, and demonstrated history of quality simulator training and operator testing, is consistent with the intent and objectives of the guidance.

¹⁰ IR 05000528/2004-015; 05000-529/2004-015; 05000-529/2004-015; August 30 - September 2, 2004; Palo Verde Nuclear Generating Station, Units 1, 2, and 3: Licensed Operator Requalification Program.

¹¹ ML11138A283, Oconee Nuclear Station Second Simulator Testing Schedule

¹² ML11138A291, Program Office Review of Oconee’s Simulation Facility
“Testing And Test Credit Plan” Scheme