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

September 9, 2016

Mr. Randall K. Edington
Executive Vice President Nuclear/
Chief Nuclear Officer
Mail Station 7602
Arizona Public Service Company
P.O. Box 52034
Phoenix, AZ 85072-2034

SUBJECT: PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3 - REGULATORY AUDIT REPORT FOR THE AUGUST 26, 2016, AUDIT AT THE WESTINGHOUSE FACILITY IN ROCKVILLE, MARYLAND, FOR THE LICENSE AMENDMENT REQUEST ASSOCIATED WITH DEGRADED AND LOSS OF VOLTAGE RELAYS (CAC NOS. MF7569, MF7570, AND MF7571)

Dear Mr. Edington:

By letter dated April 1, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16096A337), as supplemented by letter dated July 21, 2016 (ADAMS Accession No. ML16203A381), Arizona Public Service Company (the licensee) submitted a license amendment request (LAR) for Palo Verde Nuclear Generating Station (PVNGS), Units 1, 2, and 3, requesting an approval to revise the Technical Specifications (TSs). The proposed LAR would revise TS requirements regarding the degraded and loss of voltage relays (DVR and LoVR) that are planned to be modified to be more aligned with designs generally implemented in the industry. Specifically, the licensing basis for degraded voltage protection will be changed from reliance on a TS initial condition that ensures adequate post-trip voltage support of accident mitigation equipment to crediting automatic actuation of the DVR and LoVR to ensure proper equipment performance.

The U.S. Nuclear Regulatory Commission (NRC) staff conducted a regulatory audit at the Westinghouse facility in Rockville, Maryland, on August 26, 2016, in order to gain a better understanding of the licensee's DVR and LoVR LAR for PVNGS, Units 1, 2, and 3. The enclosure to this letter describes the results of the NRC staff's audit.

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

Sincerely,

Siva P. Lingam

Siva P. Lingam, Project Manager
Plant Licensing Branch IV-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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

Enclosure:
Audit Report

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REGULATORY AUDIT REPORT PERFORMED AT WESTINGHOUSE FACILITY ON AUGUST 26, 2016 IN SUPPORT OF THE DEGRADED VOLTAGE RELAY AND LOSS OF VOLTAGE RELAY LICENSE AMENDMENT ARIZONA PUBLIC SERVICE COMPANY PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3 DOCKET NOS. 50-528, 50-529, AND 50-530

1.0 BACKGROUND

By letter dated April 1, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16096A337), as supplemented by letter dated July 21, 2016 (ADAMS Accession No. ML16203A381), Arizona Public Service Company (APS, the licensee) submitted a license amendment request (LAR) for Palo Verde Nuclear Generating Station (PVNGS), Units 1, 2, and 3, requesting an approval to revise the Technical Specifications (TSs). The proposed LAR would revise TS requirements regarding the degraded and loss of voltage relays (DVR and LoVR) that are planned to be modified to be more aligned with designs generally implemented in the industry. Specifically, the licensing basis for degraded voltage protection will be changed from reliance on a TS initial condition that ensures adequate post-trip voltage support of accident mitigation equipment to crediting automatic actuation of the DVR and LoVR to ensure proper equipment performance.

The U.S. Nuclear Regulatory Commission (NRC) staff conducted a regulatory audit at the Westinghouse facility in Rockville, Maryland, on August 26, 2016, in order to gain a better understanding of the licensee's DVR and LoVR LAR for PVNGS, Units 1, 2, and 3.

2.0 REGULATORY AUDIT BASIS

To support its safety evaluation, the NRC Instrumentation and Controls Branch (EICB) conducted an audit in Rockville, Maryland. The purpose of this audit was to gain a better understanding of the modifications being performed at the plant and to confirm that revised system setpoints have been developed in accordance with regulatory requirements.

Enclosure

The basis of this audit is APS's DVR and LoVR LAR and the following regulations and regulatory guidance:

Paragraph 10 CFR 50.36(a)(1) of Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, states, in part: "Each applicant for a license authorizing operation of a production or utilization facility shall include in his application proposed technical specifications in accordance with the requirements of this section." Paragraph 10 CFR 50.36(c)(1)(ii)(A) states, in part: "Where a limiting safety system setting is specified for a variable on which a safety limit has been placed, the setting must be so chosen that automatic protective action will correct the abnormal situation before a safety limit is exceeded. If, during operation, it is determined that the automatic safety system does not function as required, the licensee shall take appropriate action, which may include shutting down the reactor."

Paragraph 10 CFR 50.36(c)(2)(i) states, in part: "Limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any remedial action permitted by the technical specifications until the condition can be met. When a limiting condition for operation of any process step in the system of a fuel reprocessing plant is not met, the licensee shall shut down that part of the operation or follow any remedial action permitted by the technical specifications until the condition can be met."

Paragraph 10 CFR 50.36(c)(3) states: "Surveillance requirements are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met."

Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 establishes the minimum necessary design, fabrication, construction, testing, and performance requirements for structures, systems, and components important to safety; that is, structures, systems, and components that provide reasonable assurance that the facility can be operated without undue risk to the health and safety of the public.

General Design Criterion (GDC) 13, states: "Instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges."

GDC 20, states: "The protection system shall be designed (1) to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and (2) to sense accident conditions and to initiate the operation of systems and components important to safety."

Regulatory Guide (RG) 1.105, Revision 3, "Setpoints for Safety-Related Instrumentation," December 1999 (ADAMS Accession No. ML993560062), describes a method acceptable to the NRC staff for complying with the NRC's regulations for ensuring that setpoints for safety-related instrumentation are initially within and remains within the TS limits. The RG endorses Part 1 of the Instrument Society of America (ISA)-S67.04-1994, "Setpoints for Nuclear Safety Related Instrumentation," subject to NRC staff clarifications. The ISA standard provides a basis for establishing setpoints for nuclear instrumentation for safety systems and addresses known contributing errors in the channel. Part 1 establishes a framework for ensuring that setpoints for nuclear safety-related instrumentation are established and maintained within specified limits.

3.0 AUDIT TEAM

The following NRC staff members participated in the audit:

- Siva P. Lingam – Project Manager
- Richard Stattel – Lead technical reviewer
- Gursharan Singh – Technical reviewer

APS was represented by the following personnel:

- Michael Dilorenzo
- Nawaporn AaronScooke
- Kent Bjornn
- David Willis

4.0 AUDIT REPORT

The NRC audit team visited the Westinghouse facility in Rockville, Maryland, on August 26, 2016, to perform this audit.

Upon completion of introductory remarks and a safety briefing provided by Westinghouse, the audit team reviewed the audit plan objectives. The NRC staff had been provided with advanced access to the calculations and the work order history data. In preparation for the audit, the NRC staff prepared a list of questions to be discussed during the audit.

Calculation Review - The NRC staff reviewed Calculation 13-EC-PB-0202, "4160 V Degraded Voltage Relay (DVR) and Loss of Voltage Relay (LoVR) Setpoint & Calibration," to confirm the proposed allowable values in Surveillance Requirement (SR) 3.3.7.4 conform to the criteria of RG 1.105, Revision 3.

Design Configuration Clarification:

The audit team asked for clarification on how components of the degraded voltage and loss of voltage functions were going to be configured in the plant design. The licensee explained that component allocation would be as follows:

ABB 27N Undervoltage (UV) Relays – These dual-function relays perform both UV detection and time delayed output functions for the system. These components are being used to perform the loss of voltage safety function and the short-stage time delay for the degraded voltage function.

Tyco Electronics Agastat series Electropneumatic Timing Relay (ETR) – These devices do not perform UV detection. They are only designed to perform a time delay function when actuated by the short-stage UV relay output. These time delay relays are being used to establish the time delay for the long-stage time delay safety function.

Because the ETR relays are only triggered upon timeout of the degraded voltage short-stage relay, the two time setpoints are added together to establish the total response time delay required for the degraded voltage long-stage function. The audit team confirmed that the uncertainties associated with both the 27N relay and the Agastat ETR relays were included in the timing uncertainty calculations for the long-stage degraded voltage function.

The NRC staff also confirmed, through discussions with the licensee and review of technical documentation, that the components of the degraded and loss of voltage systems being installed at PVNGS do not use digital or logic-based technologies and therefore will not need to be evaluated for compliance with NRC digital instrumentation and controls guidance.

Setpoint Uncertainty Factors:

Attachment 4 of the LAR provides a list of uncertainty factors considered for setpoint determination; however, this attachment did not identify which of these uncertainty factors were actually used in the setpoint calculations. Furthermore, the attachment did not provide justifications for exclusion of any of the identified uncertainty factors.

The audit team therefore reviewed the calculation to determine which uncertainty factors were being used and to review the justifications provided for terms that were considered but not used.

Work Order History Review - The NRC staff reviewed data used to calculate the uncertainty limits established for the modified system components. Refer to Sections 5.11.2 and 5.11.3 of the LAR, which contains the work order history of ABB Type 27N Relays and Agastat ETR Timers, respectively.

The surveillance voltage drop-out and time delay data provided for the 27N relays includes a significant number of samples and provides notations to explain how the data was derived from performance history. The NRC staff understands this data and will use it to evaluate the confidence levels for these devices.

The performance data provided for the Agastat ETR timers included a limited number of samples and therefore did not establish a statistically significant data set to support a confidence level of 95 percent as is recommended by RG 1.105. The NRC staff will therefore consider accepting the assumption that vendor-provided specifications are adequate to ensure required level of performance for these time delay relays. To support these assumptions, the licensee was asked to provide a description of its corrective action programs and how they will be used to confirm acceptable performance of these devices once they are put into service. This was presented to the licensee as a request for additional information (RAI) (EICB RAI Number 3 dated August 17, 2016; ADAMS Accession No. ML16230A231). The NRC staff will review the licensee's response to this RAI prior to making a safety conclusion for these devices.

It was also noted that though Agastat ETR time delay relays are safety related, they only perform an active timing function when no safety injection actuation signal is present. The audit team also notes that execution of the short-term degraded voltage safety function does not depend on the actuation of the Agastat ETR relay.

Technical Specification Bases Background Review (comments and discussion) – The audit team noted that TS mark-up page B3.3.7-1 provides a description of the new two-stage degraded voltage relay design; however, it does not provide a clear description of the loss of voltage with fixed time delay revised design. As such, there is no basis discussion of the new loss of voltage functions that are being implemented.

The licensee explained that the mark-up provided was an interim description intended to maintain the existing loss of voltage protection basis for the period during which the new functions were being implemented. The licensee also pointed out that these TS Bases mark-ups were being provided to the NRC for information only. Once all degraded and loss of voltage systems were modified at the plants, a new revision of the TS bases would be made to include a description of the fixed time delay loss of voltage functions.

5.0 CONCLUSION

The NRC staff addressed each of the audit activities outlined in the audit plan. The setpoint calculation document used for determination of degraded voltage and loss of voltage safety function components was made available for the NRC staff's review. The audit team was able to confirm setpoint program characteristics needed to support the safety evaluation. Work order history data was also made available for the NRC staff's review. The NRC staff was able to confirm plant data correlation with data provided in LAR, which will be used to support the forthcoming safety evaluation.

Principal Contributors: R. Stattel, NRR/EICB
G. Singh, NRR/EICB

Date: September 09, 2016

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-1
Division of Operating Reactor Licensing
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ADAMS Accession No.: ML16251A245 *Audit Summary by memo

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