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102-07440-BJR/DJH
May 4, 2017

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U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Reference: Arizona Public Service Company (APS) Letter No. 102-07393-BJR/DCE dated December 9, 2016, Interim 10 CFR 21 Report for General Electric Hitachi Model AKR-2BE-50 Breaker [ADAMS Accession Number ML16344A118]

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3
Docket No. STN 50-528, STN 50-529, and STN 50-530
License No. NPF 41, NPF 51, and NPF 74
Final Part 21 Report for General Electric Hitachi Model AKR-2BE-50 Breaker**

By the referenced letter dated December 9, 2016, APS submitted an interim report pursuant to 10 CFR 21.21(a)(2) that provided information regarding an on-going evaluation of a deviation in a basic component identified during pre-installation testing of an overhauled General Electric Hitachi Model AKR-2BE-50 breaker.

Pursuant to 10 CFR 21.21(d)(4), APS is providing the final report with the conclusion that the deviation could create a substantial safety hazard and is therefore a defect. The final report is provided in the enclosure to this letter.

APS makes no commitments in this letter. If you have questions regarding this submittal, please contact Matthew Kura, Nuclear Regulatory Affairs Department Leader, at (623) 393-5379.

Sincerely,

BJR/DJH

Enclosure: Final Part 21 Report for General Electric Hitachi Model AKR-2BE-50 Breaker

cc: K. M. Kennedy NRC Region IV Regional Administrator
S. P. Lingam NRC NRR Project Manager for PVNGS
C. A. Peabody NRC Senior Resident Inspector PVNGS

Enclosure

**Final Part 21 Report for General Electric
Hitachi Model AKR-2BE-50 Breaker**

Enclosure
Final Part 21.21(d)(4) Report for General Electric Hitachi Model AKR-2BE-50 Breaker

By the referenced letter dated December 9, 2016, Arizona Public Service Company (APS) submitted an interim report pursuant to 10 CFR 21.21(a)(2) that provided information regarding an on-going evaluation of a deviation in a basic component identified during pre-installation testing of an overhauled General Electric (GE)-Hitachi Model AKR-2BE-50 breaker. After further evaluation, APS has determined that the deviation represented a substantial safety hazard and is therefore a defect.

The following information is provided pursuant to 10 CFR 21.21(d)(4).

(i) Name and address of the individual or individuals informing the Commission.

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(ii) Identification of the facility, the activity, or the basic component supplied for such facility or such activity within the United States which fails to comply or contains a defect.

Facility:

Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3
Docket No. STN 50-528, STN 50-529, and STN 50-530
License No. NPF 41, NPF 51, and NPF 74

Basic Component:

Breaker Model AKR-2BE-50, 2000 Amp, 250 VDC
Serial No N8682600001

(iii) Identification of the firm constructing the facility or supplying the basic component which fails to comply or contains a defect.

GE-Hitachi Nuclear Energy
3901 Castle Hayne Rd
Wilmington, NC 28402-2819

(iv) Nature of the defect or failure to comply and the safety hazard which is created or could be created by such defect or failure to comply.

An overhauled GE-Hitachi Model AKR-2BE-50, 250 VDC, 2000 amp breaker exhibited arcing during pre-installation current injection testing. The arcing occurred between a loose Allen bolt and the internal bus bar. The loose bolt is not observable during external inspection of the breaker. APS and GE-Hitachi concluded that the deviation was the result of a human performance error wherein two Allen bolts that mount the EC-1 trip device to the internal bus bar were not fully tightened prior to shipping the breaker from the rework facility to APS. This created a loose electrical connection within the breaker that resulted in arcing at one of the bolts during current injection testing.

The current injection test is used to verify pickup and time delay setting for the EC trip device at or above the pickup setting for the Long Time, Short Time, and Instantaneous pickups. This test was performed according to the guidance of GE-Hitachi documents GEK-64459D "AKR-30/50" and AKRT-50 Maintenance Manual," section 3.2, page 10A, (May, 1996), and described in GEI-90892,

Enclosure
Final Part 21.21(d)(4) Report for General Electric Hitachi Model AKR-2BE-50 Breaker

"Field Testing of General Electric Type Overcurrent Trip Device," pages 3 and 4, (1971).

The loose fasteners and resultant high resistance electrical connection between the EC-1 protective trip device and the bus within the breaker could have, during increased design basis event loading of the Class 1E battery, resulted in excessive heating and decreased Class 1E DC bus voltage. This could have resulted in a loss of the battery train safety function. As a result, the evaluation determined that a substantial safety hazard could have been created if the breaker was installed with the defect uncorrected.

(v) The date on which the information of such defect or failure to comply was obtained.

This defect was evaluated according to PVNGS Part 21 reporting process. The evaluation was completed on April 5, 2017, and the reporting officer was informed on April 6, 2017. The defect was initially reported to the NRC by way of the Emergency Notification System on April 7, 2017 (ENS 52670).

(vi) In the case of a basic component which contains a defect or fails to comply, the number and location of these components in use at, supplied for, being supplied for, or may be supplied for, manufactured, or being manufactured for one or more facilities or activities subject to the regulations in this part.

This breaker was overhauled at the GE-Hitachi facility service center in Philadelphia and received and inspected by APS on October 10, 2016. APS owns 14 breakers. Four breakers are installed in each unit (total 12) in the Class 1E 125 VDC systems. Two additional breakers owned by APS are spares.

APS does not know if other licensees use these breakers in safety-related applications.

(vii) The corrective action which has been, is being, or will be taken; the name of the individual or organization responsible for the action; and the length of time that has been or will be taken to complete the action.

This defect was documented in the APS corrective action program. The defective breaker was repaired, successfully tested, and installed in PVNGS Unit 3. According to GE-Hitachi, this issue has been addressed within their corrective action program. GE-Hitachi reports all corrective actions have been completed, including the torqueing of primary current path fasteners, awareness training for technicians, and revision of work instructions.

Enclosure
**Final Part 21.21(d)(4) Report for General Electric Hitachi Model AKR-2BE-50
Breaker**

Individual Responsible for Actions:

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GE Hitachi Nuclear Energy

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(viii) Any advice related to the defect or failure to comply about the facility, activity, or basic component that has been, is being, or will be given to purchasers or licensees.

None.

(ix) In the case of an early site permit, the entities to whom an early site permit was transferred.

This event does not involve an early site permit.