



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

January 21, 2016

LICENSEE: Arizona Public Service Company

FACILITY: Palo Verde Nuclear Generating Station, Units 1, 2, and 3

SUBJECT: SUMMARY OF DECEMBER 17, 2015, MEETING WITH ARIZONA PUBLIC SERVICE COMPANY REGARDING THE ONGOING RESOLUTION OF GENERIC LETTER 2004-02 FOR PALO VERDE NUCLEAR GENERATING STATION, UNITS 1, 2, AND 3 (CAC NOS. MC4702, MC4703, AND MC4704)

On December 17, 2015, the U.S. Nuclear Regulatory Commission (NRC) staff hosted a Category 1 public meeting conference call with staff from Arizona Public Service Company (APS, the licensee) at NRC Headquarters, One White Flint North, 11555 Rockville Pike, Rockville, Maryland. The purpose of this meeting was to discuss the insulation discovery and resolution options related to NRC Generic Letter (GL) 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors," dated September 13, 2004 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML042360586), for Palo Verde Nuclear Generating Station (PVNGS), Units 1, 2, and 3. The meeting notice and agenda, dated November 24, 2015, are available at ADAMS Accession No. ML15328A379. The licensee provided presentation slides, which are available at ADAMS Accession No. ML15348A054. The Enclosure contains the list of attendees.

The licensee presented an overview of the recent insulation discovery and provided information regarding resolution of GL 2004-02 for PVNGS. On December 18, 2013, APS submitted Revision 2 to the supplemental response to GL 2004-02 (ADAMS Accession No. ML13357A218). On April 15, 2015, APS documented its failure to identify and evaluate microtherm on the reactor vessel by entering it into the corrective action program. The microtherm was discovered in several locations on the reactor vessel, including an approximately 10-foot band encompassing the hot- and cold-leg elevation, during an unrelated review of plant drawings. On June 10, 2015, the NRC staff hosted a public teleconference with APS to discuss the recently discovered microtherm. The June 10th meeting summary and the licensee's presentation slides are available at ADAMS Accession Nos. ML15239B322 and ML15156B352, respectively. In the June 10th meeting, the licensee presented three potential outcomes for a path forward to resolve GL 2004-02. On August 26, 2015, the NRC staff hosted another public teleconference with APS. At the August 26th meeting, the licensee stated its plan to pursue Option 3 (justify current configuration with microtherm using further evaluation and testing). The August 26th meeting summary and the licensee's presentation slides are available at ADAMS Accession Nos. ML15268A131 and ML15236A134, respectively.

The licensee discussed the possible reactor vessel microtherm break locations and identified the steam generator (SG) hot-leg nozzle as the previously analyzed most limiting break location. The licensee detailed the locations of another type of fiber-based insulation that was found on the reactor pressure vessel (RPV) and reactor coolant system piping in isolated locations, called

Temp-Mat. As discussed in the August 26th meeting, this is in addition to the microporous insulation, Microtherm, found in April 2015. The licensee stated its plan to keep the current configuration of the Microtherm (Option 3) and to also remove some of the Temp-Mat. The licensee also stated its plans to remove Nukon (another type of fibrous insulation) on the feedwater lines, even though this insulation is not within any zone of influence required to be evaluated for loss-of-coolant accident (LOCA) breaks. The licensee stated that this insulation could not be damaged during a LOCA, but could add to the chemical effects if it were submerged following a LOCA. The insulation will be removed to maintain chemical effects margins. The NRC staff asked when the licensee plans to finish removing parts of the Temp-Mat and Nukon. Removal of the Temp-Mat in Units 1, 2, and 3 will maintain a low-fiber amount. The licensee noted that a greater amount of Temp-Mat was discovered in Unit 3 and, therefore, more will be removed from Unit 3. The licensee stated it has already removed the insulation from Unit 2 and will complete Unit 1 in spring 2016 and Unit 3 in fall 2016 during the outages. The newly discovered Temp-Mat affects the existing limiting break location (SG hot-leg nozzle) and impacts the new RPV break location. More information on the location of the recently discovered Temp-Mat can be found on Slide 6 of the licensee's presentation slides.

The licensee then discussed the results of its analysis, including debris generation, debris transport, chemical effects load, D-ring break, RPV nozzle breaks, and head loss/net positive suction head (NPSH). The licensee stated that PVNGS remains a low fiber plant and the Microtherm impact is inconsequential because the NPSH and structural limits will be maintained. To minimize the debris generation, the licensee discussed its primary success path is to remove the Temp-Mat for the current limiting break in order to restore the analysis-of-record conditions for D-ring break conditions. The licensee intends to show that the Microtherm does not reduce margins for RPV nozzle breaks by performing an analysis to show that the current analysis bounds head losses that could occur with the newly discovered debris loads. The licensee noted that the encapsulated Microtherm zone of influence and the restrained separation of the pipe at the RPV nozzle break limits the amount of Microtherm that could be generated by any break location. The licensee then discussed debris transport, specifically, if there was an RPV nozzle break. The licensee stated the Temp-Mat generated within the reactor compartment will transport to the reactor cavity (underneath the RPV), but debris other than fines will not transport to strainers based on very low-flow velocity and a large upward vertical flow path in the cavity. The licensee noted that all generated Microtherm and Temp-Mat fines are assumed to transport to the strainers. APS estimated the chemical effects load using Westinghouse Electric Company LLC's topical report WCAP-16530-NP, "Evaluation of Post-Accident Chemical Effects in Containment Sump Fluids to Support GSI [Generic Safety Issue]-191," and determined that the test of record for PVNGS used higher chemical effects loads than defined by the analysis of record. APS discussed testing for Salem Nuclear Power Plant, Unit 2 (Salem U2) to analyze head-loss conditions for post-LOCA scenarios with Min-K insulation which is very similar to Microtherm. For D-ring and RPV nozzle breaks, the chemical effects load is less than the licensee's test of record and less than Salem U2 test 6. The licensee stated that the Salem U2 test bounds PVNGS and the analysis indicates that the PVNGS NPSH and structural limits should be bounded by the existing SG hot-leg break location. The NRC staff requested the licensee to provide a comparison of the debris load from both PVNGS and Salem's tests, including the difference in velocity, in the supplement.

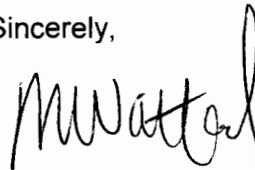
The licensee then summarized the presentation with an overview of the resolution path for D-ring and RPV nozzle break cases and removal of the fiber in each of the units. APS stated its plan to submit the supplement to GL 2004-02 around mid-April 2016. The NRC staff asked if

the licensee plans to close out as an Option 1 plant (15 grams of fiber per fuel assembly limit) using WCAP-16793, "Evaluation of Long Term Core Cooling Associated with Sump Debris Effects." APS stated that it still plans to close out GL 2004-02 as an Option 2a plant for PVNGS.

The NRC did not receive any public meeting feedback forms. A member of the public, Ms. Ruth Thomas, questioned if there is a potential impact of debris blockage on emergency recirculation during design-basis accidents at other plants. The NRC staff explained that this is a generic issue for all pressurized-water reactors. The NRC staff appreciated the comment and plans to perform a more in-depth review once the licensee submits its addendum to its GL 2004-02 response.

If you have any questions, please contact me at (301) 415-1233 or via e-mail at Margaret.Watford@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "MWatford", written in a cursive style.

Margaret M. Watford, 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:
List of Attendees

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LIST OF ATTENDEES

DECEMBER 17, 2015, PUBLIC MEETING WITH ARIZONA PUBLIC SERVICE COMPANY

REGARDING ONGOING RESOLUTION OF GENERIC LETTER 2004-02

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

| Name | Affiliation |
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| Margaret Watford | NRC |
| Bob Pascarelli | NRC |
| Gloria Kulesa | NRC |
| Victor Cusumano | NRC |
| Steve Smith | NRC |
| Paul Klein | NRC |
| Marioly Diaz Colon | NRC |
| Andrea Russell | NRC |
| John Stang | NRC |
| Thomas Weber | APS |
| Michael DiLorenzo | APS |
| Carl Stephenson | APS |
| Alfred Meeden | APS |
| Dominic Macedonia | APS |
| Carl Stafford | APS |
| Andrew Roudenko | Alion |
| Ruth Thomas | Public |
| Tim Sande | Public |

Enclosure

the licensee plans to close out as an Option 1 plant (15 grams of fiber per fuel assembly limit) using WCAP-16793, "Evaluation of Long Term Core Cooling Associated with Sump Debris Effects." APS stated that it still plans to close out GL 2004-02 as an Option 2a plant for PVNGS.

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Sincerely,

/RA/

Margaret M. Watford, 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

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List of Attendees

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ADAMS Accession Nos. ML16011A058 (Mtg Summary); ML15328A379 (Mtg Notice); ML15348A054 (licensee slides) *via e-mail

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|--------|--------------------|--------------------|--------------------|
| OFFICE | NRR/DORL/LPL4-1/PM | NRR/DORL/LPL4-1/LA | NRR/DE/ESGB/BC |
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| DATE | 1/11/16 | 1/11/16 | 1/12/16 |
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| NAME | VCusumano* | RPascarelli | MWatford |
| DATE | 1/19/16 | 1/19/16 | 1/21/16 |

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