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AUTH.NAME AUTHOR AFFILIATION
KRAINIK,A.K. Arizona Public Service Co. (formerly Arizona Nuclear Power
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SUBJECT: Forwards draft comments on NRC repts "Evaluation of Air-Operated Valves at US Light-Water Reactor (1999)" & "Idaho National Engineering & Environ Lab rept (INEEL)/EXT-98-00383,Study of Air-Operated Valves in NPPs.

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Commitment, Innovation, Energy

Palo Verde Nuclear Generating Station
Angela K. Krainik
Director, Regulatory Affairs
Tel. 623-393-5421
Fax 623-393-5442
Mail Station 7636
PO Box 52034
Phoenix, Arizona 85072-2034

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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102-04319-AKK/SAB/JAP
July 30, 1999

Dear Sirs:

Subject: **Palo Verde Nuclear Generating Station (PVNGS)**
Units 1, 2, and 3
Docket Nos. STN 50-528/529/530
Comments on Draft NRC Reports "Evaluation of Air-Operated Valves at U.S. Light-Water Reactors (1999)" and "Idaho National Engineering and Environmental Laboratory report (INEEL)/EXT-98-00383, A Study of Air-Operated Valves in Nuclear Power Plants"

Arizona Public Service Company (APS) was one of seven utilities that participated in the above mentioned INEEL report. In the proposed draft of this report there are several items that APS believes require further clarification to ensure that the study accurately reflects the status of the Air-Operated Valve (AOV) program and findings at our utility.

Our comments on the INEEL report are enclosed. In order to ensure that the study is accurate and complete, we believe that these comments need to be included prior to the final issue of the INEEL report. No commitments are being made to the NRC by this letter.

If you have any questions, please contact Scott A. Bauer at (623) 393-5978.

Sincerely,

Angela K Krainik

AKK/SAB/JAP/rlh
Enclosure

cc: E. W. Merschoff
N. Kalyanam
J. H. Moorman
H. L. Ornstein

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ENCLOSURE

Comments on NRC draft study "Idaho National Engineering and Environmental Laboratory Report (INEEL)/EXT-98-00383, A Study of Air-Operated Valves in Nuclear Power Plants"

The following comments are submitted regarding INEEL Report number INEEL/EXT-98-00383:

The report states in Section 8.1.2 Letdown Containment Isolation Valve Leakage (page 12):

"Modifications were made to all three AOVs with undersized actuators. Stroke lengths were reduced on all three actuators and the bench set was increased on one AOV. Later, it was discovered that the higher bench set exceeded the manufacturers' maximum recommended safe spring load. PVNGS thereafter determined that the higher bench set was acceptable because the valve is 'normally open and rarely stroked' and thus the assumed 1000 cycles used in the calculations was conservative. "

The following is suggested to complete the information.

Modifications were made to all three AOVs with undersized actuators. Stroke lengths were reduced, the actuators' springs were replaced and the bench sets were increased on all three actuators. Prior to the modification, one actuator had the bench set increased to provide seat load. Later, it was discovered that the higher bench set exceeded the manufacturers' maximum recommended safe spring load and stem load. PVNGS thereafter determined that the higher bench set was acceptable because the valve is normally open and rarely stroked and thus the assumed 1000 cycles used in the calculations was conservative.

The report states in Section 8.1.3, Downcomer Feedwater Isolation Valve Failures:

"From the perspective of this study, the significance of these AOV failures was that the actuators were undersized and had been known to be undersized for some time....."

The following is suggested to complete the information:

From the perspective of this study, the significance of these AOV failures was that the actuators were marginally sized to open the valves... The actuators were not known to be marginally sized to open the valves until the calculation was completed as part of the Root Cause of Failure Investigation.

Continuing in Section 8.1.3:

"...However, the AOVs failed to open following the cooldown of the unit, and as such, the failures were not classified as safety-related failures. Also, the failures were considered by the licensee as not being Maintenance Rule functional failures. The failure mode that occurred was not considered by PVNGS to be safety-significant or subject to review under the requirements of the Maintenance Rule. Further, as noted above, these valves were not within the scope of either NRC Generic Letters 89-10 or 95-07."

The following is suggested to complete the information:

...However the AOVs failed to open following the cooldown of the unit, and as such, the failures were not classified as safety-related failures. Also, the failures were considered by the licensee as not being Maintenance Rule functional failures. The failure mode that occurred was not considered by PVNGS to be safety-significant because the open function was not credited in the safety analysis. The failure was not subject to review under the requirements of the Maintenance Rule because the system function was not required in the plant mode when the failure occurred. Further, as noted above, these valves were not within the scope of either NRC Generic Letters 89-10 (these are not MOVs) or 95-07 (DCFWIVs are normally open valves).

The report states in 8.1.5, AOV Margin Calculations:

"Among the observations made during the visit to PVNGS for this study, it was noted that several safety-related AOVs had low margins, according to the calculations that were furnished for discussion. Further, globe and gate valve thrust prediction methods that have been shown to be non-conservative, from motor-operated valve test results, were being used as follows:

Globe valves: The licensee's engineers were using the port area times the differential pressure (DP) times 1.0 in their thrust estimate calculations. Historical industry guidance had been to use the port area times DP times 1.1. Guidance from the EPRI testing for unbalanced globe valves is to use either the port area or the guide area (valve design dependent) times DP times 1.1. Depending on the particular valve design, the required-thrust estimates are at least 10% low."

The following is suggested to complete the information:

Among the observations made during the visit to PVNGS for this study, it was noted that several safety-related AOVs had low margins, according to the calculations that were furnished for discussion. Specifically:

Globe valves: The licensee's engineers were using the port area times the differential pressure (DP) times 1.0 in their thrust estimate calculations. Instrument Society of America guidance is to use the port area times DP times 1.0. Motor-operated valve testing for other types of globe valves would indicate a valve factor of 0.9 to 1.1. Depending on the particular valve design, the licensee thrust estimates may be as much as 10% low. It is important to note that the air-operated globe valves used at Palo Verde have not been dynamically tested in a Generic Letter 89-10 type of program to verify valve factors. Also the licensee has only found physical valve/actuator performance issues with actuators (for globe valves) which were not sized in accordance with the original equipment manufacture's published recommendations.

Justification:

Since the only dynamic testing of the globe valves covered in the referenced calculation is proprietary to Fisher Controls, there is no basis to state MOV testing has shown the calculations to be non-conservative.

Continuing in Section 8.1.5:

"Gate Valves: The licensee's engineers were using the port area times DP times a valve factor of 0.6 in their thrust estimate calculations. A valve factor of 0.6 is reasonable for cold water systems. INEEL and EPRI test results both support the use of a mean seat area [0.5 X (inside diameter +outside diameter)]. Depending on the size of the valve the required thrust estimates are at least 10% low."

The following is suggested to complete the information.

Gate Valves: The licensee's engineers were using the seat area (as provided by the valve manufacturer) times DP times a valve factor of 0.6 in their thrust estimate calculations. A valve factor of 0.6 is reasonable for cold water systems. INEEL and EPRI test results both support the use of a mean seat area [0.5 X (inside diameter + outside diameter)].

Justification:

Palo Verde had originally used the port area for the thrust estimates but had revised the calculation to use the seat area prior to the NRC visit. The calculation had an error in that some text explaining the calculation indicated the port area was used rather than the seat area. This text was missed as part of the calculation revision to use seat area and has since been revised. The quantitative part of the calculation reviewed by the NRC actually used the seat area even though the text indicated the port area had been used.

Additional information to be included in 8.1.5:

In addition, this section of the report should indicate that Palo Verde has initiated several margin improvement modifications based on the AOV capability calculations. These modifications cover 15 Category I and II valves in each unit.

The report states in Section 16.3 (page 78) and Section 17:

" At almost all plants visited, a number of pertinent AOV and SOV-related events and conditions, including common-cause failure events and conditions, were not included in Licensee Event Reports or reports to the industry databases. "

" - The operating experience gathered for this study and observed in the plants during the recent visits indicates that many AOVs are risk-significant. During the plant visits we learned of many common-cause failure events and deficiencies that had been reported in plant condition reports or plant deficiency reports but were not reported in LERs or in industry reliability database reports..."

Comment:

All of the events discussed in this report about Palo Verde were reported to either the NPRDS/EPIX or INPO OE network. In reviewing several other plants' information, these events were also reported to INPO through NPRDS/EPIX or INPO OE network. It is suggested that the specific industry databases be mentioned or remove the comment about the industry databases. In addition, the implication of the comment regarding LERs is that LERs for each of the events were required but were not written. For Palo Verde, the event for the DCFWIV was not reportable per the requirements of 10CFR 50.73.

The report states in Appendix C (page 3):

"Among the pertinent observations, it was noted that several safety-related AOVs had low design margins, in accordance with current Palo Verde calculations, and that the quality of the air supply was monitored intermittently for moisture content. Further, globe and gate valve thrust prediction methods that have been shown to be non-conservative, per motor-operated valve test results were (at the time of the visit) being used."

The following is suggested to complete the information:

Among the pertinent observations, it was noted that several safety-related AOVs had low design margins, according to the PVNGS calculations, and the quality of the air supply was monitored intermittently for moisture content.

Justification:

Since the only dynamic testing of the globe valves covered in the referenced calculation is proprietary to Fisher Controls, there is no basis to state MOV testing has shown the calculations to be non-conservative.

The report states in Appendix C (page 3):

"Gate valves: Palo Verde used the seat area (equal to the port area of the valve) provided by the valve manufacturer, e.g., Anchor Darling, times DP times a valve factor of 0.6 in their thrust estimate calculations. INEEL and EPRI test results both support the use of a mean seat area (0.5 X [inside diameter + outside diameter]). A valve factor of 0.6 is reasonable for cold water systems. Depending on the size of the valve, the Palo Verde Thrust estimates were, based on our understanding of the issues, at least 10% low."

The following is suggested to complete the information:
Gate Valves: The licensee's engineers were using the seat area (as provided by the valve manufacturer) times DP times a valve factor of 0.6 in their thrust estimate calculations. A valve factor of 0.6 is reasonable for cold water systems. INEEL and EPRI test results both support the use of a mean seat area [0.5 X (inside diameter +outside diameter)].

Justification:

Palo Verde had originally used the port area for the thrust estimates but had revised the calculation to use the seat area prior to the NRC visit. The calculation had an error in that some text explaining the calculation indicated the port area was used rather than the seat area. This text was missed as part of the calculation revision to use seat area and has since been revised. The quantitative part of the calculation reviewed by the NRC actually used the seat area even though the text indicated the port area had been used.

The report states in Appendix C Item 9 (page 6), 17 (page 8) and 31 (page 12):

"Globe and gate valve thrust prediction methods that had not been validated and that had been shown to be non-conservative per MOV testing were, at the time of the visit, being used. "

The following is suggested to complete the information:

Globe and gate valve thrust prediction methods that had not been validated were being used.

Justification:

Since the only dynamic testing of the globe valves covered in the referenced calculation is proprietary to Fisher Controls, there is no basis to state MOV testing has shown the calculations to be non-conservative. In addition, MOV dynamic testing had shown valve factors of 0.9 to 1.1 for various types of globe valves. This does not support a global statement that all globes should have a valve factor of 1.1. Palo Verde had originally used the port area for the thrust estimates (for gate valves) but had revised the calculation to use the seat area prior to the NRC visit. The calculation had an error in that some text explaining the calculation indicated the port area was used rather than the seat area. This text was missed as part of the calculation revision to use seat area and has since been revised. The quantitative part of the calculation reviewed by the NRC actually used the seat area even though the text indicated the port area had been used.