

May 6, 2005

MEMORANDUM TO: Herbert N. Berkow, Director
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

FROM: Michael D. Tschiltz, Chief */RA/*
Probabilistic Safety Assessment Branch
Division of Systems Safety and Analysis
Office of Nuclear Reactor Regulation

SUBJECT: ASTM E741 TESTING OF PALO VERDE UNITS 1-3 CONTROL ROOM
ENVELOPES

On July 9, 2004, Arizona Public Service (APS) requested approval of an amendment to their operating licenses for Palo Verde Nuclear Generating Station (Palo Verde) Units 1 and 3. This amendment request, if approved, would enable the replacement of the existing steam generators at Units 1 and 3 and a 2.94 percent power increase at each unit. Staff review of the licensee's submittal determined that the licensee had requested this approval without having conducted testing that confirmed the inleakage characteristics of the Units 1 and 3's control room envelopes (CREs).

In their July 9, 2004, submittal, the licensee stated that an integrated pressure boundary leak test had been performed on Palo Verde Unit 2 that confirmed the total unfiltered inleakage assumption used in the control room habitability analysis. The submittal further stated that the results of this validation test demonstrated that the design assumption of 61 scfm unfiltered inleakage bounds the actual as-built plant condition. In the July 9, 2004, submittal APS also made reference to their December 5, 2003, response to Generic Letter (GL) 2003-01. In their response, APS indicated that no tracer gas testing would be conducted on the CREs of Units 1 and 3 in order to confirm their inleakage characteristics.

During a March 30, 2005, meeting, APS representatives presented their arguments for concluding that the tracer gas testing of Palo Verde Unit 2's CRE sufficiently demonstrated the inleakage characteristics of all three Palo Verde CREs and that testing of the Units 1 and 3's CREs was unnecessary. During the meeting, APS presented ΔP measurement data for all three CREs. In their response to GL 2003-01, APS had indicated that these measurements "adequately demonstrated that the design and operation of the three CREs are identical and thus are bounded by the design and licensing basis for unfiltered inleakage."

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In response to questions raised at the March 30, 2005, meeting, APS also provided additional information via email to the Nuclear Regulatory Commission project manager. This information was provided during the April 18-19, 2005, time frame.

The Probabilistic Safety Assessment Branch (SPSB) has evaluated the information presented at the meeting and in the email. SPSB has concluded the following:

1. The validity of the tracer gas test performed at Palo Verde Unit 2 is questionable. Therefore, it is unsuitable for demonstrating the inleakage characteristics of Units 1 and 3.
2. Palo Verde's response to GL 2003-01 is inadequate because APS has not confirmed for Units 1 and 3's CREs that the most limiting unfiltered inleakage into their CRE is no more than the value assumed in their design basis analyses.
3. The enhanced ΔP measurements conducted on the three Palo Verde CREs have not demonstrated that the performance of the CREs is identical. Rather than that they seem to demonstrate that each CRE's performance is different. Therefore, these enhanced ΔP measurements do not support the licensee's assertion that CRE inleakage testing does not need be performed at Units 1 and 3. Finally, whether the performance of any unit's CRE is within its licensing basis for inleakage has yet to be confirmed.

The bases for the above conclusions are contained in the attachment to this memorandum.

As a result of the above conclusions, SPSB believes that processing of the Palo Verde Units 1 and 3 amendment requests to replace their steam generators and to increase the licensed power at each unit by 2.94 percent should only occur if satisfactory ASTM E741 testing of Palo Verde Units 1 and 3 occurs. We believe that such testing should be completed by the end of December 2005. In addition, we have determined that the results of the previously performed CRE inleakage test at Palo Verde Unit 2 are questionable and retesting should be performed in a timely manner in order to address the information requests of GL 2003-01.

Attachment: As stated

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Attachment: As stated

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ASSESSMENT OF CONTROL ROOM HABITABILITY
AT THE PALO VERDE NUCLEAR GENERATING STATION

SPSB has concluded that:

1. The validity of the tracer gas test performed at Palo Verde Unit 2 is questionable. Therefore, it is unsuitable for demonstrating the inleakage characteristics of Units 1 and 3.
2. Palo Verde's response to GL 2003-01 is inadequate because APS has not confirmed for Units 1 and 3's CREs that the most limiting unfiltered inleakage into their CRE is no more than the value assumed in their design basis analyses.
3. The enhanced ΔP measurements conducted on the three Palo Verde CREs have not demonstrated that the performance of the CREs is identical. Rather than that they seem to demonstrate that each CRE's performance is different. Therefore, these enhanced ΔP measurements do not support the licensee's assertion that CRE inleakage testing does not need to be performed at Units 1 and 3. Finally, whether the performance of any unit's CRE is within its licensing basis for inleakage has yet to be confirmed.

The basis for the first conclusion is the following. The ASTM E741 test was performed at Palo Verde Unit 2 with one train of the control room essential ventilation system operating in the pressurization mode and the other train of the control room essential ventilation system operating in the recirculation mode. This is not the mode of operation in the event of a radiological challenge.

In the event of a radiological challenge only one train of the essential ventilation system is operating to pressurize the CRE. No other control room ventilation system is operating nor is the other train of the essential ventilation system operating in the recirculation mode. At a March 30, 2005, meeting with the staff, APS indicated that the reason for operating with the second train of the essential ventilation system in recirculation was to obtain an equilibrium concentration of tracer gas so that the E741 test could be performed. However, the staff's experience has been that unless the CRE is divided into a number of distinct and segregated volumes, it does not take long for the tracer gas to reach an equilibrium concentration in the CRE. Therefore, it was unnecessary to operate the other train of the essential ventilation system in order to obtain adequate mixing. In addition, where mixing is required to establish an equilibrium concentration, portable mixing devices have been utilized in other tracer gas tests.

When APS performed enhanced ΔP measurements in 2003, they conducted the measurements with only the A train of the essential ventilation system in the pressurization mode of operation and then with only the B train of the essential ventilation system in the pressurization mode of operation. At no time was any essential ventilation system train in the recirculation mode.

ATTACHMENT

During the March 30, 2005, meeting, APS presented the ΔP data from the enhanced pressure measurements. At the meeting, SPSB noted at least five locations where a comparison of the differences in ΔP measured during the tracer gas test and the ΔP measured during the enhanced ΔP measurement program were significant. These differences in pressure ranged from at minimum of 0.1 inch w.g. to over 0.5 inch w.g. depending upon which essential ventilation system train was operating. In every case, the pressure during the tracer gas test was higher than the pressure measured during the enhanced ΔP measurement program. The issue that needs to be addressed is why were these results so different. The staff has concluded that the only way for the pressure to be so much greater during the E741 test is for the train in the recirculation mode of operation to be bringing outside air into the Unit 2 CRE. This additional pressurizing air caused an increase in pressure in the CRE. Somehow, this additional air was not accounted for by the individuals performing the Unit 2 tracer gas test. Therefore, the staff concluded that when the enhanced ΔP test pressures were less than the ΔP pressures during the ASTM E741 test because the amount of pressurizing air was less when one train was pressuring the CRE than when one train was pressuring the CRE and the other was in recirculation. Therefore, the staff has concluded that the results of the E741 test of the Palo Verde Unit 2 CRE are questionable.

Concerning the staff's second conclusion, GL 2003-01 requested that licensees provide information which confirmed their unfiltered and filtered leakage. The leakage for Palo Verde Units 1 and 3 has not been confirmed as requested by the GL. What APS has done has been to assess the leakage characteristics of Units 1 and 3's CREs based upon the leakage results of the test of the Unit 2 CRE. However, GL 2003-01 did not request an assessment. It requested confirmation. What APS has done has not been a confirmation. In addition, as noted above, the results of the Unit 2 test are themselves questionable.

Regarding the staff's third conclusion, APS has proposed that the results of the enhanced ΔP measurements and the ASTM E741 test of the Unit 2 CRE demonstrate that the design basis leakage value is met for all three CREs. APS has proposed such a conclusion because APS has demonstrated similarity between the three units' CREs. The staff has concluded that APS has not demonstrated similarity. The three units cannot be considered identical in performance when the differential pressure at the same location for each of the three units is different. Since they are different, there is no basis for concluding that Unit 1 is performing the same as Units 2 and 3. The fact that they are different is an indication that either the conditions in the CREs or the areas adjacent to the CREs are different in each of the units. If the pressures are different, then one would expect the leakage characteristics to be different. Therefore, it is necessary that APS confirm each unit's CRE's leakage characteristics.