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

May 16, 1999

MEMORANDUM TO: Brian W. Sheron, Associate Director
for Project Licensing and Technical Review, NRR

FROM: Jack R. Strosnider, Director
Division of Engineering, NRR

SUBJECT: LESSONS LEARNED FROM PALO VERDE WITHDRAWAL FROM THE RISK-INFORMED INSERVICE TESTING (RI-IST) PILOT PLANT EFFORT

By letter dated December 17, 1998 (attached), Arizona Public Service Company (APS), the licensee for the Palo Verde Nuclear Generating Station (PVNGS), withdrew as a pilot plant for RI-IST. APS withdrew based on their assessment of minimal potential safety and cost benefits of an RI-IST program at Palo Verde as compared to other risk-informed applications. The purpose of this memorandum is to discuss the lessons learned from the Palo Verde withdrawal and its significance on RI-IST activities as they are currently evolving.

Background

APS originally submitted to the NRC its RI-IST program on November 27, 1995. Palo Verde and Comanche Peak were two RI-IST pilot plants with generally similar proposals. Both utilities committed substantial resources to the RI-IST effort. They recognized they were at the leading edge of an industry and staff effort to establish regulatory criteria for RI-IST programs and industry templates that others could follow. The Comanche Peak RI-IST program was approved on August 14, 1998.

In a letter to the NRC dated August 1, 1997, APS informed the staff that its resources must be diverted for a time from the RI-IST program development effort in order to complete other activities (e.g., the 10-year IST program update and improved technical specification implementation). Due to these resource constraints and operational priorities, APS stated that it would not be in a position to resume supporting the RI-IST implementation effort until mid-1998. In late 1998, APS decided not to resume its RI-IST pilot activity.

Basis for Withdrawal

In its December 17, 1998, letter, APS withdrew its RI-IST application and discussed the reasons for its decision. These reasons had previously been discussed with the staff in several telephone conversations. APS believes that a RI-IST program, as described in Regulatory Guide 1.175, would have little safety or cost benefit at PVNGS. The licensee noted that, in its view, safety would not be significantly improved at PVNGS because: 1) only one additional component, outside the scope of the current IST program, would be categorized as a "high safety significant component" (HSSC) and included in the RI-IST program, and 2) the enhanced testing (of HSSCs) recommended by RG 1.175 is already performed on many IST components through the PVNGS Predictive Maintenance Program and other site-specific valve testing programs (some of which go beyond ASME Code requirements). APS believes that

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implementing a RI-IST program may result in a cost increase because: 1) RG 1.175 only allows use of NRC-approved test methodologies, and 2) RG 1.175 outlines a performance monitoring and corrective action process that may exceed traditional program requirements and current Maintenance Rule requirements. APS stated that the continuing administrative burden associated with the performance monitoring and corrective action process would negate the cost savings associated with the reduced testing of components categorized as having low safety significance.

APS Proposal

In its December 19, 1998, letter, APS recommended that the staff give consideration to a more performance-based regulatory approach to IST. This approach would utilize performance criteria consistent with the reliability assumptions in the licensee's PRA and other expert panel deliberations. APS's proposed approach would allow licensees the flexibility to use any test, maintenance, and corrective action strategies they believe are appropriate in order to meet the performance criteria rather than use prescriptive Code test requirements. APS believes that such an approach would be beneficial to both cost and safety.

Reevaluation of Performance Monitoring and Corrective Action Guidelines Presented in the Regulatory Guides

In light of APS's comments, members of the SPSB and EMEB staff reevaluated the guidelines discussed in RG 1.174 (general risk-informed guidance) and 1.175 (RI-IST specific guidance). In comparing the performance monitoring guidance from these two RGs, it is evident that RG 1.175 provides more specific performance monitoring guidelines (component failure) than RG 1.174 (overall plant safety/performance).

The differences in performance monitoring guidance between these two RGs are partially attributed to the fact that RG 1.174 presents general guidelines for making risk-informed decisions on plant-specific changes to the licensing basis while RG 1.175 presents guidelines specifically for RI-IST of components (i.e., pumps and valves). Therefore, the performance monitoring guidance in RG 1.175 is more focused on component-level monitoring since the purpose of IST is to ensure the operational readiness of components. However, by recommending that appropriate parameters be trended to ensure the component (whether of high- or low-safety significance) remains operable over the test interval, the guidelines appear to establish conservative, performance and operability expectations. It is noted that the RGs suggest that less rigorous testing and monitoring approaches may be appropriate for LSSCs.

In Section 2.3 of RG 1.174, the staff explains that the primary goal for performance monitoring strategies is to ensure that no adverse safety degradation occurs because of changes to the licensing basis. A principal concern is the possibility that the aggregate impact of changes that affect a large class of SSCs could lead to an unacceptable increase in the number of failures from unanticipated degradation, including possible increases in common cause failure mechanisms. This concern is also raised in Section 3.3 of RG 1.175 by the statement that component failure rates cannot be allowed to rise to unacceptable levels (e.g., significantly higher than the failure rates used to support the change) before detection and corrective action take place. When changes are made to the test strategies (i.e., test frequency and methods) new common cause failure mechanisms may be introduced or the probability of existing common cause failure mechanisms may be increased. This could lead to the failure of a large

number of pumps and valves in a full scope RI-IST program. For this reason, the staff established performance monitoring guidelines at the component level to provide assurance that unexpected increases in failure rates of a large group of pumps and valves would not occur as a result of changing test strategies.

With respect to staff guidelines on feedback and corrective action, RG 1.174 presents guidelines stating that the monitoring program should identify any corrective actions to preclude the recurrence of unacceptable failures or degraded performance. RG 1.175 presents more detailed guidelines regarding how the corrective action program should be structured. The RG 1.175 guidelines state that if a component fails or degrades at a higher rate than assumed in the basis for the RI-IST program: 1) the causes of the failure or degradation should be determined and corrective action implemented, and 2) the component's test effectiveness should be re-evaluated and the RI-IST program should be modified accordingly.

RG 1.175 specifies six attributes of the corrective action program. It states the evaluation of the corrective action program should:

(1) Comply with Criterion XVI, "Corrective Action," of Appendix B to 10 CFR Part 50,

(2) Promptly determine the impact of the failure or nonconforming condition on system/train operability and follow the appropriate technical specification when component capability cannot be demonstrated,

(3) Determine and correct the apparent or root cause of the failure or nonconforming condition (e.g., improve testing practices, repair or replace the component). The root cause of failure should be determined for all components categorized as having high safety significance as well as for components categorized as having low safety significance when the apparent cause of failure may contribute to common cause failure,

(4) Assess the applicability of the failure or nonconforming condition to other components in the RI-IST program (including any test sample expansion that may be required for grouped components such as relief valves),

(5) Correct other susceptible RI-IST components as necessary, and

(6) Consider the effectiveness of the component's test strategy in detecting the failure or nonconforming condition. Adjust the test interval and/or test methods, as appropriate, where the component (or group of components) experiences repeated or age-related failures or nonconforming conditions.

In reviewing the six attributes, it appears that the first five are requirements of a corrective action program that are already implemented as part of 10 CFR Part 50, Appendix B, Criterion XVI. The last attribute appears to be consistent with RG 1.174, although it is likely that existing plant procedures would have to be modified or additional plant procedures would need to be developed.

Assessment to Date

Although guidance in RG 1.175 indicates that testing and performance monitoring approaches for LSSCs may be less rigorous for LSSCs than for HSSCs, the staff's guidance on performance monitoring of LSSCs exceeds traditional IST program requirements and current maintenance rule requirements. The intent of the performance monitoring guidance was to ensure that no insidious failure mechanisms that are related to the revised test strategies become important enough to alter the failure rates assumed in the justification of the program changes and to ensure that adequate component capability (i.e., margin) exists above that required during design-basis conditions, so that component operating characteristics over time do not result in reaching a point of insufficient margin before the next scheduled test activity. The staff recognizes that occasional random failures of individual LSSCs could be tolerated, however, the staff believes that components, including LSSCs should not routinely be allowed to be found in a failed state when the inservice test is performed.

However, when risk insights and/or other engineering results (supported by appropriate performance data) indicate that a particular component or group of components (e.g., LSSCs) does not contribute to plant risk, even when common cause failures are considered, the RG 1.175 guidance on performance monitoring and corrective actions may be unnecessarily conservative. For example, when a bounding estimate on the change in risk from the change in the IST program shows insignificant increase in plant risk, the staff may accept a licensee proposal to relax certain aspects of RG 1.175. The staff need not wait to modify RG 1.175 before approving such requests.

Even though RG 1.175 acknowledges that a less rigorous approach may be used for LSSCs, it may be difficult for a licensee to determine just what that approach entails. More specific guidance in this area may be appropriate. Approaches currently being considered include a reduced "level of assurance" of operability over the IST interval for LSSCs and system-level performance monitoring pursuant to the Maintenance Rule for LSSCs.

The staff believes it is premature to propose any specific changes to RG 1.175 as an outcome of the APS withdrawal. As additional reviews are completed over the next 6-12 months additional insights are expected and changes could then be considered.

Other Risk-Informed IST Activities

Although the focus of the lessons-learned review is on PVNGS, this review should be considered in the light of other RI-IST activities currently in progress. The South Texas Project (STP) and San Onofre Nuclear Generating Station (SONGS) licensees recently submitted RI-IST applications. The STP application is limited in scope, and is intended to provide flexibility in testing schedules for twenty-four check valves. The SONGS application is a full scope application and the licensee states that the program will be beneficial in outage management.

In addition, the STP licensee is planning to submit a full-scope RI-IST program to the NRC in the summer of 2000, and the Davis Besse licensee is considering a limited scope RI-IST submittal for air-operated valves (AOVs).

Note that when RI-IST methods are used in limited-scope applications, it may be possible to bound potential increases in common cause failures by calculating the increase in plant risk assuming failures of all components within the scope of the application. By doing so, the need to retain conservative performance monitoring expectations as discussed above may be significantly diminished.

Planned Staff Actions

The staff recently completed the Comanche Peak RI-IST pilot plant review and issued its safety evaluation report (SER) on August 14,1998. The costs and benefits associated with implementing the RI-IST program at Comanche Peak are yet to be determined. Other licensees (South Texas and San Onofre) have recently submitted RI-IST applications. The staff plans to gain more experience with the South Texas and San Onofre submittals and with implementation of the RI-IST program at Comanche Peak. Lessons learned from these applications and from the Palo Verde pilot will be incorporated into the potential revision to the RI-IST guidance provided in RG 1.175 as appropriate within the next year (reference Staff Requirements Memorandum dated June 29, 1998, related to SECY-98-067).

The staff will provide a copy of this review to APS and will contact NEI to discuss the withdrawal of Palo Verde as a RI-IST pilot plant and any follow up activities as may be appropriate.

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