FirstEnergy

Davis-Besse Nuclear Power Station
5501 North State Route 2
Oak Harbor, Ohio 43449-9760

Guy G. Campbell
Vice President - Nuclear

419-321-8588
Fax: 419-321-8337

Docket Number 50-346

License Number NPF-3

Serial Number 2720

July 17, 2001

United States Nuclear Regulatory Commission
Document Control Desk
Washington, D.C. 20555-0001

Subject: Response to Request for Additional Information Concerning Risk-Informed Inservice Testing Program for Air Operated Valves (TAC Number MB0520)

Ladies and Gentlemen:

By letter Serial Number 2668, dated September 11, 2000, the FirstEnergy Nuclear Operating Company (FENOC) requested, pursuant to 10 CFR 50.55a(a)(3)(i), implementation of a Risk-Informed Inservice Testing (RI-IST) Program as an authorized alternative to the currently Nuclear Regulatory Commission (NRC)-endorsed American Society of Mechanical Engineers (ASME) Code specified by 10 CFR 50.55a(f) for the Davis-Besse Nuclear Power Station (DBNPS). By that letter, Phase 1 implementation of a RI-IST Program for air-operated valves was requested, with Phase 2 (motor-operated valves), Phase 3 (check valves), and Phase 4 (pumps) requests to follow at later dates.

The NRC staff provided a request for additional information (RAI) regarding the previous FENOC letter submittal by letter dated June 4, 2001 (Log Number 5809). The attached provides the DBNPS responses to those RAIs.

If you have any additional questions or comments, please contact Mr. David H. Lockwood, Manager, Regulatory Affairs, at (419) 321-8450.

Very truly yours,

RMC/s

Attachment

A047

cc: J. E. Dyer, Regional Administrator, Region III
S. P. Sands, NRC Project Manager
K. S. Zellers, DB-1 Senior Resident Inspector
Utility Radiological Safety Board

RESPONSE TO PROBABLISTIC SAFETY ASSESSMENT BRANCH (SPSB)/MECHANICAL AND CIVIL ENGINEERING BRANCH (EMEB) REQUEST FOR ADDITONAL INFORMATION (RAI) RISK-INFORMED INSERVICE TESTING PROGRAM FOR AIR-OPERATED VALVES

RAI 1. Based on BAW-2359, Section 3.2, Section 4.1, Section 5.3, and Section 6.1, Davis-Besse (DBNPS) appears to have used the JOG AOV Program scoping criteria, which relies in part on the safety designation of the component (e.g., safety-related) and its safety significance (e.g., HSSC), to establish the AOVs to be considered as candidates for the DBNPS risk-informed (RI) AOV Program, which includes the DBNPS RI-IST Program for AOVs. However, at the scoping phase, safety significance has not been quantitatively or qualitatively determined. Use of the JOG Program scoping criteria to determine the AOVs that need to be classified as HSSC or LSSC may prematurely eliminate some AOVs. For the DBNPS application, did the selected initial set of AOVs include all the safety-related AOVs, PRA-identified AOVs, JOG Program-identified AOVs, current IST Program AOVs, and any other AOVs that may be risk-significant when considering their importance during non-full power operations (i.e., startup, shutdown, and spent fuel pool cooling) and external conditions (e.g., seismic events, fires, and floods)? Please provide more detail on the scoping that was done to determine the initial set of AOVs that were chosen for potential inclusions in the DBNPS RI-IST Program for AOVs to ensure that all potential HSSC AOVs were identified and evaluated.

<u>Response</u>:

Yes. The following criteria was used to determine scope that was chosen for potential inclusion in a RI-AOV Program:

1. Components modeled explicitly or implicitly in the DBNPS PSA
2. Components confirmed to support a Maintenance Rule function
3. Components currently in the IST Program
4. All Q-Related components (safety-related)
5. All AQ-Related components (augmented quality)
6. All PQ-Related components (plant quality)

RAI 2. Per BAW-2359, Section 1.3, Section 5.1, and Section 6.1, there is reliance on the JOG Program. However, the JOG AOV Program only addresses "active" safety-significant AOVs. An "active" AOV is defined in the JOG AOV Program as "a valve that must perform a mechanical motion during the course of accomplishing a system safety-significant function." (JOG AOV Program Section 2 – Revision 1, December 2000) In JOG AOV Program Section 4.1.3 additional considerations of an AOV being active are provided. However, these considerations only address AOVs that are moved to non-safety positions during testing or maintenance. It is not clear how DBNPS defines what an "active" AOV is and what considerations are included. For example, it could include considering: (a) periodic system/component realignments (e.g., a normally-open AOV that may be closed as part of testing or maintenance activities, which would have to be open to achieve its safety-significant position); (b) the potential for AOVs to drift open or closed between test cycles, which would then require mechanical movement to achieve its safety-significant position; (c) conditions in which the air supply is used to maintain an AOV in its safety-significant position (e.g., a normally-open AOV whose safety-significant position is to remain open, closes on loss of air supply); and/or (d) AOVs that have multiple safety-significant positions (e.g., for one condition the AOV must close, but then for other conditions the AOV must open or re-open after being closed). Does DBNPS have any "passive" AOVs? If so, please clarify how DBNPS defines an "active AOV, including what conditions are considered when determining an AOV is or is not "active."

Response:

The DBNPS has no passive AOVs in the RI AOV Program. The DBNPS uses the guidance provided in NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," and ASME OM Code 1995, 1996 Addenda, Subsection ISTC 1.3 in making the active/passive determination.

RAI 3. In the DBNPS worksheet, the F-V and RAW values are single entries, thus they only address CDF, but not LERF, importance. Further, the sensitivity studies and performance history are not explicitly addressed, but may be incorporated under other headings, and not all important failure modes are explicitly identified (e.g., PSA-modeled failure modes and failure modes associated with its safety functions including other operating modes and conditions such as for shutdown and external events). For example, AOV CC1471 is identified as HSSC and the text in BAW-2359 Section 6.9 indicates that all HSSC AOVs were already in the IST Program. From the text discussions in BAW-2356 Section 6, which are not captured in the worksheets, this AOV was initially in Quadrant A but was upgraded to HSSC due to the sensitivity studies. The results of the sensitivity studies need to be summarized in the worksheets to support the final classification of the AOV as HSSC. Where are these factors (i.e., LERF importance values, failure modes, performance history, and sensitivity studies), which are identified in the BAW-2359 generic worksheet, documented?

Response:

The LERF importance values, failure modes, and sensitivity studies are documented in DBNPS calculations. The performance history is documented in detail in the Preventive Maintenance Basis Document and System notebooks. The worksheets provide a summary and are not intended to be all-inclusive. These documents are available for inspection at the plant site.

RAI 4. Based on the discussions at the public meeting on January 25, 2001, and a review of the submitted information, including the DBNPS worksheets in BAW-2359 Appendix D, it appears that only the 83 AOVs already in the current IST Program were classified according to safety significance.

a. In the Risk Informed Classification block there is a box for being "out of scope" in addition to boxes for HSSC and LSSC. The "out of scope" box appears to be the determination that the AOV is not included in the RI-IST Program as a result of the safety-significance determination process. However, this is a conclusion of the process and does not mean that the AOV is neither HSSC nor LSSC. For example, AOV CW620 is in Quadrant A, which means it is LSSC, but this box is not checked. The approach should be to address all AOVs considered (i.e., all 180 AOVs included in the evaluation) by determining them to be either HSSC or LSSC using a blend of the PSA risk ranking, including the related sensitivity studies, and the deterministic/traditional engineering considerations by the expert panel. PSA-identified LSSC AOVs may also be raised to HSSC by the expert panel when considering the deterministic/traditional engineering factors and non-PSA AOVs may be classified as HSSC or LSSC by the expert panel upon their insights using the deterministic/traditional engineering considerations. If the AOV is in the current IST Program, then it remains in the RI-IST Program. In addition, per Regulatory Guide (RG) 1.175, any other AOV identified as HSSC by this integrated decisionmaking process should also be included in the RI-IST Program (e.g., AOV CW620). Why weren't all 180 AOVs in the evaluation classified as either HSSC or LSSC? Were any AOVs outside the current IST Program classified as either HSSC or LSSC? Please clarify if the above described approach was used by DBNPS and/or if any changes to the evaluations/worksheets are needed to make them consistent with this approach.

Response:

All 180 AOVs evaluated by the expert panel were not required to be classified as either HSSC or LSSC unless the probabilistic criteria and deterministic/traditional engineering considerations indicated they were HSSC or LSSC. Therefore, even though all AOVs that were considered for potential inclusion in a RI-IST Program were not classified as either HSSC or LSSC, the process described above, and the process used by DBNPS would yield the same result. For example, CW620 is LSSC, and using both the probabilistic and deterministic/traditional engineering considerations by the expert panel, was placed in the DBNPS RI-AOV Program Category 2 (active, LSSC).

With regards to the question concerning AOVs outside the current IST Program classified as either HSSC or LSSC, the DBNPS scope and categorization process determined AOVs outside the scope of IST to be either HSSC or LSSC.

RAI 4.b AOV CT2955 is identified as being in Quadrant D, but is classified as out of scope; contingent upon development of a test to verify its operability. However, Quadrant D AOVs are to be considered HSSC per BAW-2359 Section 3.8. Further, this AOV may be important as it relates to the loss of service water initiating event and related impacts from external events. Since this worksheet indicates that the test had not been developed (at least when the expert panel completed the worksheet initially), this AOV should be classified as HSSC and should be put in Category 1 of the DBNPS RI AOV Program until the test is developed and the RI AOV Program methodology is re-applied with the new information. Has DBNPS developed the recommended flow test? If not, does DBNPS plan to conduct all the requirements of the RI AOV Program for a Category 1 AOV until this test is developed and the RI AOV Program methodology is re-applied for this AOV? How will this program change be documented?

Response:

The DBNPS has not developed the flow test at this time; therefore, the DBNPS concurs that the process places this AOV into DBNPS RI-AOV Program Category 1 and this AOV will be treated as Category 1. Any program changes will be documented through the expert panel process.

RAI 4.c AOV SP13A3 is stated as being important for mitigating plant transients, but then this condition seems to be discounted because it does not have a formally-defined "safety function" and is marked as being "out of scope" even though it is in Quadrant A, which would infer it should be at least LSSC. This AOVs safety-significance classification may be even more important since it is stated to have a poor maintenance history. The AOV should be classified and treated according to its importance, regardless of its formal designation. If the AOV is important, the reason for its importance needs to be addressed and documented in the worksheet. Did DBNPS consider an AOV's formal safety function designation in determining its RI-IST Program safety-significance classification? If so, how does this approach ensure that the RI-IST Program captures all HSSC AOVs, including those without a formal safety function designation?

Response:

Yes. However, the formal safety classification of an AOV assembly was not solely used for making the safety significance classification. Other deterministic/traditional engineering factors were also included in the integrated decision making process. For example, the scope and categorization process placed this AOV into the DBNPS RI-AOV Program Category 2 (active, LSSC) without regard to safety classification. The approach taken for HSSC components was to ensure they were captured in the DBNPS RI-AOV Program Category 1.

RAI 5. Based on the discussions at the public meeting on January 25, 2001, and a review of the submitted information, including the DBNPS worksheets in BAW-2359 Appendix D, the deterministic/traditional engineering factors do not appear to have been considered, or were not documented as being considered, in the RI-IST Program safety-significance classification of AOVs.

a. Per BAW-2359 Section 3.5 and Section 6.6, the Risk Informed IST Program Inclusion Considerations block of the DBNPS worksheets is supposed to be used to support the safety-significance classification of AOVs, which is recorded in the Risk Informed Classification block. This approach is consistent with RG 1.175. However, the worksheets do not reflect this approach, at least for AOVs CC1460, CC1467, CC1471, CV5004, CV5007, DH14B, ICS11A, MS100, MS5889A, MU38, MU66A, SP6B, and SW1424. As an example, for AOV CC1460, which is classified as LSSC, every consideration in the Risk Informed IST Program Inclusion Consideration block states that "This component is already in the IST Program." It is inferred from this entry that because the AOV was already in the IST Program, the expert panel did not consider the deterministic/traditional engineering factors or at least the considerations were not documented on the worksheets. The safety-significance classification of each AOV should include both the PRA/quantitative considerations and the deterministic/traditional engineering considerations. These latter considerations, which are provided in the Risk Informed IST Program Inclusion Considerations block, need to be documented and used in support of the Risk Informed Classification block determinations, especially if they indicate an LSSC may need to be upgraded to an HSSC (or vice versa) or for AOVs that cannot be, or are not represented in the PRA models. Please explain how the deterministic/traditional engineering factors are used as part of the safety-significance classification of AOVs and where these considerations are documented.

Response:

Using the guidance provided in the ASME OMN-3 Code Case, the qualitative assessments were discussed during the expert panel deliberations to make the safety significance classifications. The probabilistic and deterministic/traditional engineering considerations for making the safety significance determination are documented in the Key Decision Basis section of the worksheets.

RAI 5.b AOV CD420 is stated as not being modeled in the PSA, however, it is stated in the maintenance reliability entry that detection of its failure would occur due to it initiating a transient. If this AOV's failure results in a transient, then it is part of the loss of main feedwater transient initiating event, which should be modeled in the PSA. The impact of component failures on initiating events is specifically stated as needing to be considered in the deterministic/traditional engineering factors cited in BAW-2359 Figure 3-2. The potential impact on this initiating event and its poor maintenance history may support this AOV being classified HSSC if its contribution to the loss of main feedwater initiating event is significant (and this initiating event has a significant contribution to core damage). How were the impacts of AOV failures on initiating events considered by the expert panel and factored into the safety-significance classification of the AOVs?

Response:

The loss of main feedwater transient initiating event is modeled in the PSA. However, since this specific component was not modeled, and using the guidance provided in ASME OMN-3 Code Case, the expert panel did not believe that the qualitative considerations warranted the HSSC classification. Therefore, the process placed this AOV into the DBNPS RI-AOV Program Category 2 (active, LSSC).

RAI 5.c The decision basis for AOV CW620 indicates that it can initiate a plant transient and complicate plant shutdown, but because it does not have a "safety-significant function" it is not considered HSSC. How were the plant transient, shutdown, system reliability, and defense-in-depth affects dismissed as not being important enough for this AOV to be HSSC?

Response:

These specific events were deliberated by the expert panel. As a result, the expert panel believed that, even though the AOV was important for system reliability and availability, the failure of this component and the resultant transient would be easily detectable and operator intervention would mitigate the consequences of failure through defense in depth. Therefore, the scope and categorization process confirmed the LSSC designation and placed this AOV into the DBNPS RI-AOV Program Category 2 (active, LSSC) to ensure operational readiness.

RAI 5.d Does AOV SP6B have an impact on, or can it induce, a plant transient if it closes? If so, was this impact considered in the safety-significance classification of the AOV?

Response:

Yes. The DBNPS expert panel recognized the importance of this AOV and its impact on initiating events and placed this AOV into DBNPS RI-AOV Program Category 2 (active, LSSC) to ensure operational readiness.

RAI 6. Per BAW-2359 Section 3.4 and ASME Code Case OMN-3, the general sensitivity studies are required. Please describe how each of the sensitivity studies was conducted.

Response:

Sensitivity studies were performed for data, testing and maintenance, human action, LSSC failure rates and common cause uncertainties. The following summarizes the methods and results of each of these studies.

Data and Uncertainties

Failure probabilities of valves, used the PRA model, were increased and decreased by a factor of ten to determine if the results are sensitive to changes in the failure data. The factor of ten was applied because it was assumed to be sufficiently large to encompass the possible variance in data.

The results for this sensitivity study were generated by first changing the individual valve failure rates then re-calculating the importance measures. The effect on the RAW for the valves was insignificant; however, the F-V importance measures for several valves were found to be sensitive to a factor of 10 increase in the failure rate. Valve DH14A was moved from a quadrant B to quadrant C based on these results.

Testing and Maintenance Uncertainties

For this study the testing and maintenance events were set to zero and the importance measures were re-calculated. No valves switched importance quadrants due to removal of maintenance events.

Human Action Uncertainties

The approach taken for this study was to remove the human events from the master PRA fault tree and then re-quantify the model with no human events. The importance measures were re-calculated using the modified PSA model. Except for two cases, AOVs became less important when human events were removed.

DH14B became more important, but this was already a quadrant C valve. The RAW of MU38 also increased, but this did not change the valve's quadrant.

LSSC Failure Rate Uncertainties

The results of this study were generated by first changing the individual valve failure rates to the 95th percentile of the cumulative log normal probability distribution, then re-calculating the importance measures for each valve. DH14A was not included in the study since it was already determined to be a quadrant C valve. No valve in the study changed importance quadrants based on this study.

Common Cause Uncertainties

The AOVs that have common cause failure modes in the PRA model were re-evaluated with the common cause failure probabilities increased and decreased by a factor of 100. The results were generated by first changing the individual valve failure rates then re-calculating the importance measures. MS5889A and MS5889B showed some sensitivity to common cause failure rates but the magnitude was not sufficient to change the quadrant for these valves.

RAI 6.a The human factors sensitivity study indicates that the "...PRA is requantified...after human actions modeled in the PRA to recover from the specific component failures are removed from the models." How does DBNPS interpret "specific component failures?" Is the intent of this phrase to meet Section 2.3.3.3 of RG 1.175 which states that credit should not be taken for post-accident recovery of failed components (e.g., repair or ad hoc manual actions such as manually forcing open a stuck valve)? Is the model requantified after all component failure recoveries are removed or after only the AOV failure recoveries are removed?

Response:

The DBNPS PSA does not generally credit recovery of failed components and no credit is taken for recovery of any air operated valve (AOV) failures. Consequently, the human recovery sensitivity study was performed by removing the post initiator human events from the PSA. The modified fault tree was re-quantified and the importance measures were re-evaluated. No valves were re-categorized to a different quadrant based on the human recovery sensitivity study. This would not be unexpected because the human reliability analysis does not credit specific recoveries of AOVs.

RAI 6.b Did DBNPS address both aspects of the CCF sensitivity study: increasing the AOV CCF event probabilities and requantifying the model? When the CCF probabilities were increased, were they set to unity or to some other value (e.g., multiple greek letter beta/gamma multipliers)? When the CCF probabilities were reduced, were they set to zero or some other value?

Response:

For the DBNPS sensitivity study the model was re-quantified with common cause multipliers increased and decreased by a factor of 100 for applicable valves. The factor of 100 was chosen because it was considered to be large enough to conservatively bound possible range of common cause multipliers. After the common cause multipliers were modified the importance measures were re-calculated.

RAI 7. BAW-2359 Section 3.8 states that a component in Quadrant B should be assumed to be HSSC unless there are known compensatory measures to support downgrading it to LSSC. Quadrant B AOVs are not risk-significant, except when they are out of service. Thus, a proper compensatory measure would need to assure that the AOV is available and operable/functional during plant operating modes in which the AOV must function. Further, Section A3.1 of the DBNPS submittal states that all AOVs in Quadrant B were categorized as HSSC. DBNPS has identified only one AOV in Quadrant B, AOV MU38, but it is designated as LSSC instead of HSSC.

Response:

The DBNPS concurs that Section A3.1 of the previous DBNPS submittal incorrectly states that AOVs in Quadrant B were categorized as HSSC. The initial ranking based solely on the PSA insights categorized MU38 as HSSC; however, based upon the deterministic/traditional engineering insights, MU38 was downgraded to LSSC.

RAI 7.a The AOV's importance measures indicate that it is not relatively important during normal conditions, since it is normally open and its RCP seal injection safety function (as opposed to its isolation, fail-safe, safety function) is to remain open. However, the AOV becomes relatively important when out-of-service (i.e., closed), which could result from maintenance events, failure to remain open, or failure to reopen/be reopened after closing. There are conditions in which this AOV may need to be reopened after being closed by a real or spurious SFAS Level 3 signal. Were the spurious signals modeled in the PSA and was the need for the AOV to reopen following real or spurious signals modeled in the PSA?

Response:

The PSA model included spurious closure of MU38. However, the human action to re-open this valve after spurious closure was not modeled. Recovery from spurious failures of MU38 was not modeled because spurious failures are a negligible contributor to the overall core damage frequency.

RAI 7.b It does not appear that the deterministic/traditional engineering factors were considered for this AOV since it is already in the IST Program. Were deterministic/traditional engineering factors considered in the downgrading of this AOV and, if so, where are these considerations documented?

Response:

The Risk Informed IST Program Inclusion Considerations section of the worksheet was intended to document the basis for including the AOV into a RI-IST Program. Since this AOV was already in the IST Program, the basis for inclusion in a RI-IST Program is not applicable. The deterministic/traditional engineering factors for downgrading this AOV from HSSC to LSSC are documented in the Key Decision Basis section of the worksheet.

RAI 7.c It is important that this AOV be maintained open during normal conditions, as well as following upset conditions, which may require operator actions to reset isolation signals and manually reopen this AOV. Per BAW-2359 Section 6.7 and Section 6.9, the focus of the decision criteria for this Quadrant B AOV seems to be to lower it from HSSC to LSSC based on the compensatory measure that the AOV is placed in the RI AOV Program Category 2 to ensure timely preventive maintenance and setpoint control. This is basically the same text presented for some Quadrant A AOVs. This seems to be inconsistent with BAW-2359 Section 3.8 as these actions will not provide the controls to address the particularities that make this AOV important. The specific rationale for downgrading an AOV from HSSC to LSSC should be documented, preferably in the DBNPS worksheet. Please explain how the cited compensatory action addresses the condition that makes this AOV important and revise the worksheet to more appropriately reflect the specific rationale for downgrading the AOV.

Response:

Based upon the expert panel deliberations, MU38 was recognized as being important when taken out of service for any of the reasons cited in RAI 7.a. As a result, the failure modes and effects that would place this component out of service are addressed under the operational readiness strategies required of a

DBNPS RI-AOV Program Category 2 AOV coupled with the other considerations documented in the Key Decision Basis (i.e. Appendix J, and Preventive Maintenance).

RAI 8. DBNPS submittal Section A.3.1 states that all Quadrant B and C AOVs were classified as HSSC. There are 11 Quadrant C AOVs and 1 Quadrant B AOV. In addition, the 2 AOVs in Quadrant D are identified in BAW-2359 Section 6.9 as being HSSC, as well as 2 AOVs in Quadrant A that were raised to HSSC due to the sensitivity studies. These 16 AOVs that are stated to be HSSC are modeled in the DBNPS PSA. DBNPS submittal Section A3.1 also states that the 3 AOVs not modeled in the DBNPS PSA were also classified as HSSC, but these 3 non-PSA HSSC AOVs are not identified. Thus, there appears to be a total of 19 HSSC AOVs, but DBNPS submittal Section A.3.3 states that there are only 15 HSSC AOVs, which are also listed in BAW-2359 Section 6.9. Please clarify this apparent discrepancy and identify the 3 non-PSA HSSC AOVs, including if these AOVs are already in the DBNPS IST Program or if they have been added to the DBNPS RI-IST Program and if they have been placed in Category 1 of the DBNPS RI AOV Program.

Response:

The DBNPS submittal incorrectly identifies three AOVs not modeled in the PSA categorized as HSSC. In fact, there are no AOVs outside the PSA that were categorized as HSSC. Therefore, including the valve identified in response to RAI 4.b, there are 16 AOVs that have been placed in Category 1 of the DBNPS RI-AOV Program.

RAI 9. As a result of the classification process, some AOVs were identified as having weaknesses in their operability/performance testing. In these cases, DBNPS identified modifications that would be implemented to address these weaknesses.

a. AOV CC1471 is identified as HSSC. From the text discussions in BAW-2359 Section 6, this AOV was upgraded to HSSC even though it was initially in Quadrant A as a result of the sensitivity studies that were performed. It is stated in the DBNPS worksheet for the normal function entry and the other considerations entry that there is a plant modification planned to ensure the AOV fails open. It is also stated that the modification will eliminate the AOV from the IST and JOG AOV Program requirement. As part of the risk-informed process, since the AOV is part of the current IST Program, the AOV may be downgraded to LSSC and its RI AOV Program category changed to 2 or 3, but it should not be eliminated from the RI AOV Program or the RI-IST Program for AOVs. This discussion in the worksheet needs to be clarified.

Response:

AOV CC1471 and its redundant train AOV, CC1474, will be modified. Until this modification is implemented, which removes the air from the actuator and fails it in its safety-related position, these AOVs will be treated as Category 1 in the DBNPS RI-AOV Program. After the modification, these two AOVs will become manual, passive AOVs and by definition, will be treated as Category 3 in the DBNPS RI-AOV Program. Failure modes and effects of the modified AOV will be determined and the appropriate operational readiness strategies for Category 3 AOVs will apply.

RAI 9.b For AOV ICS11A, it is stated on the worksheet that a modification during the cycle 12 refueling outage will replace this AOV. Will the replacement be with a similar type AOV? How does this replacement affect the RI-IST Program safety-significance classification and the RI AOV Program categorization?

Response:

AOV ICS11A and its redundant train AOV, ICS11B, were replaced with an equivalent replacement in the cycle 12 refueling outage. There was no change in the safety significance classification and the resultant DBNPS RI-AOV Program categorization. The failure modes and effects of the replacement AOV were considered in developing the operational readiness strategy.

RAI 9.c For modifications that impact the determinations used in the RI-IST Program, how does DBNPS plan to control and document the RI-IST Program implementation changes? Will DBNPS re-convene the expert panel and revise the analyses and worksheets using the RI AOV Program methodology before implementing different RI AOV Program Category requirement? If so, does DBNPS plan to conduct all the requirements of the existing RI AOV Program Category for the affected AOV until the modification is completed?

Response:

The DBNPS recognizes that the PSA model and component performance is dynamic and that changes to scope may occur. Modifications that affect programs, such as the IST and AOV Program, are required by procedure to be reviewed by the applicable program owner. In addition, changes to the PSA, and resultant scope are addressed within the Maintenance Rule procedure. The expert panel, which convenes on a regular basis, would be required to approve any change in scope to the DBNPS RI-AOV Program utilizing the process described by this and the previous Serial 2668 submittal.

RAI 10. For AOV DH14B, the compensatory action entry states it is in Category 2 of the DBNPS RI AOV Program. It should state, based on the checked box in the worksheet, that it is in Category 1.

Response:

The DBNPS concurs that the worksheet incorrectly identifies in the compensatory action statement that DH14B is in Category 2. The worksheet will be revised to reflect that DH14B is Category 1.

RAI 11. In BAW-2359 Section 3.10 and Section 6.10.2, it is stated that grouping components and testing on a staggered basis over a test frequency reduces the importance of common cause failure. Staggered testing allows the AOVs to be tested over a lengthened interval, with the presumption that if degraded performance is detected, other similar AOVs (including those susceptible to common cause failure) will be tested to verify their continued operability. Only in this manner is CCF potential affected for a group of AOVs. Does the DBNPS feedback and corrective actions processes have the requirement to verify the operability/performance of similar AOVs if degraded performance is identified for an AOV?

Response:

Yes. The DBNPS corrective action program requires an extent of condition to be performed for issues and, as applicable, to apply corrective actions to grouped AOVs if degraded performance is identified through the corrective action process.

RAI 12. Based on the discussions at the public meeting on January 25, 2001 and a review of the DBNPS submitted information, the aggregate risk calculations appear to have taken credit for other periodic tests. This is a reasonable consideration in calculating the aggregate risk if these other tests adequately validate the operability of the AOVs. However, the periodic test that is used as a basis for the test interval (and thus the AOVs standby time) should be documented, preferably in the DBNPS worksheets.

a. Per BAW-2359 Section 6.11, the change in risk is stated as being zero. Is this due to the fact that all AOVs have other tests performed on a regular basis that demonstrate operability (i.e., were there any AOVs that did not have another periodic test credited)? How/Where are these other tests documented? Please explain the reason for the negligible change in risk.

Response:

Components that apply standby failure rates have the test interval basis documented in the applicable PSA system notebook. The basis includes a reference to the appropriate test or procedure number. This practice was identified as a strength of the DBNPS PSA during the November 1999 peer review.

For AOVs, the aggregate risk calculated was negligible for the following reasons:

(1) A number of valves did not have failure modes that would be impacted by test intervals modeled in the PSA. For example, the function of the seal return valve (MU38) in the PSA is to remain open and failure of this valve to remain open would be quickly detected during normal operation. Therefore, a change in the test interval has no effect on the PSA.

(2) For the DBNPS PSA, the practice is to only credit tests for valves if the monitoring of system response by verification of flow is possible. Consequently, the tests used for the IST program were generally not credited as the basis of the PSA test interval for those valves that had failure modes impacted by test intervals.

RAI 12.b RG 1.175 indicates that the preferred method of calculating the CDF and LERF values is by requantifying the PSA model, as opposed to only requantifying the original PSA cutsets. Did DBNPS requantify the PSA model?

Response:

The process used at DBNPS for calculating importance measures based on core damage frequency involved first evaluating the cut sets. If the AOV was categorized as risk significant (risk achievement worth greater than 2) based on the cut sets, no further evaluations were performed. For AOVs that were not risk significant based on the cut sets, the model was re-quantified. This process ensured that a conservative analysis was performed while minimizing the quantification time.

The DBNPS level 2 containment event tree is very detailed and the quantification time required to re-quantify the model for each component would have been prohibitive. Therefore, the LERF importance information was calculated using only cut sets. Based on the results of the level 1 calculations, this would have minimal impact on the results.

RAI 13. This RAI is applicable only for those AOVs in which the aggregate risk calculations use an increased test interval from that of the original PSA model as a result of implementing the RI-IST Program. If the response to the above question (RAI 12) indicates that there are no AOVs that had an increased test interval for the aggregate risk calculation, then this RAI does not apply and can be skipped.

RAI 13.a. Actuation circuitry and signal logic operability is typically confirmed as a result of valve testing, unless other tests are conducted to verify their operability. In the aggregate risk calculations, how are associated valve actuation circuitry and signal logic failure probabilities and common cause failure probabilities addressed by the increased test interval? Are these failure probabilities also increased proportionally with the increased test interval?

RAI 13.b. BAW-2359 Section 3.11 indicates that the sensitivity studies from BAW-2359 Section 3.4 are to be re-performed based on the increased test interval. Did DBNPS re-perform the sensitivity studies using the increased test intervals? What is done if an LSSC becomes an HSSC as a result of increasing the test interval? Does DBNPS reclassify the AOV as HSSC and return the test interval back to the original code of record or are additional compensating measures identified and credited for maintaining these AOVs as LSSC? If the latter, how does DBNPS justify and document the LSSC classification and the adequacy of the associated compensatory measures?

RAI 13.c. Since Quadrant B AOVs are numerically already HSSC due to their RAW value, but possibly lowered by the expert panel to LSSC due to known compensatory measures, it is not clear how these AOVs become HSSC based on the safety-significance recalculations per BAW-2359 Section 3.11 unless their F-V values also increase enough to become HSSC too. How are the safety-significance classifications reconsidered for these AOVs?

RAI 13.d. BAW-2359 Section 3.11 allows an alternative in which the component failure history is separated by time-related and demand-related failure modes. This alternative failure data manipulation would require the licensee to provide additional justification of the appropriateness of the standby failure rate used in the model. For example, demand failure rates typically have an inherent, unstated, assumption that they are tested regularly. If the time between tests or AOV manipulations that would provide positive evidence of functionality (i.e., the standby time) exceeds quarterly, then the demand failure rate must include time-related factors (i.e., use a standby failure rate). In simple terms, the assumption is that the longer an AOV is in the same position, the greater the likelihood that it won't be able to change position when required. Therefore, even if the component failure history is separated into cyclic and time-in-service failures, the current history represents the conditions in which the assumption on testing is valid, allowing consideration for demand failures separate from time-dependent failures. However, for the proposed extended intervals the assumption on regular/frequent testing may not be valid and a standby demand failure rate, which is also time-dependent, would have to be used. Did DBNPS use this alternative approach? If DBNPS used this alternative, please describe the process to ensure that the failure data manipulation is appropriate.

Response:

Based upon the response provided in RAI 12, RAI 13 does not apply.

RAI 14. Since the development of BAW-2359 and the DBNPS submittal, the JOG AOV Program guidance has been revised, including the categorization criteria, such that any AOV that is HSSC is placed in RI AOV Program Category 1, regardless of its designation as safety-related or not. Thus, those AOVs that are HSSC should be maintained at the highest level of the DBNPS RI AOV Program (i.e., Category 1) and the LSSC AOVs can be segregated further based on their function and features and other criteria per the DBNPS AOV RI Program Categories (i.e., Categories 2 or 3 or out of scope), with all current IST Program AOVs required to be at least Category 3. The JOG AOV Program revision affects BAW-2359 Section 5.1 categorization criteria and DBNPS categorization criteria, as described in BAW-2359 Section 6.10.3 and as documented in the AOV Program Categorization block of the DBNPS worksheets.

a. RG 1.175 states that the licensee's RI-IST Program should include non-Code components (i.e., components not currently in the IST program) that the licensee's integrated decisionmaking process categorizes as HSSC. Per the revised JOG AOV Program guidance, the HSSC AOVs should also receive the most extensive capability evaluation, such as that provided by also identifying them as RI AOV Program Category 1. Does DBNPS have any HSSC AOVs that are not placed in the RI-IST Program and/or not placed in RI AOV Program Category 1? If so, please update the worksheet categorization criteria to reflect the current criteria for RI AOV Categories 1, 2, and 3 and revise the entries for any affected AOVs.

Response:

No. The HSSC components are in DBNPS RI-AOV Program Category 1. The worksheets are being revised to identify DBNPS RI-AOV Program Category 1 as active, HSSC.

RAI 14.b Are all current DBNPS IST Program AOVs required to be placed in one of the three DBNPS RI AOV Program Categories (i.e., none are out of scope)?

Response:

Current DBNPS IST components are in one of the three DBNPS RI-AOV Program categories.

RAI 14.c How will DBNPS address future changes to the referenced JOG AOV Program or ASME Code Cases, which form the underlying bases for its RI-IST Program for AOVs? How will program changes be documented and under what conditions will these changes require a resubmittal to the NRC for review and approval?

Response:

In general, changes determined by the licensee under the 10 CFR 50.59 process to not have an impact on the licensing basis of the plant would not be submitted unless NRC prior-approval is required. However, future changes would follow the requirements of 10 CFR 50.55a and Regulatory Guide 1.175.

RAI 15 The current testing requirements in the ASME Code for AOVs are to stroke-time test each safety-related AOV and compare the tested value with acceptance criteria as specified by the Code at intervals of once every three months. DBNPS, in conjunction with their RI-IST submittal, has proposed to use an alternative test strategy for safety-related and high safety-significant, non safety-related, AOVs in lieu of the ASME Code requirements. The following questions are related to the details of DBNPS's new test strategy.

a. Clarify the definitions of Category 1, 2 and 3 AOVs.

Response:

Category 1: Active, HSSC
Category 2: Active, LSSC
Category 3: Safety-Related, not in Category 1 or 2.

RAI 15.b Clarify the use of dynamic-test based information (e.g., plant-specific data, industry validated methodologies, etc.) to confirm the design-basis capability in terms of operating requirements and actuator output for safety-related and high safety-significant Category 1, 2 and 3 AOVs which are included in the DBNPS RI AOV Program.

Response:

Utilizing the guidance provided in Appendix A of the JOG AOV Program, dynamic test based information will be used for prediction of thrust or torque using either plant specific data or industry validated methodologies to confirm the design basis capability. Initially, the focus will be on Category 1 AOVs. Any representative valve assembly in Category 2 that is not covered in the Category 1 evaluation will also require evaluation utilizing this methodology. Any issues identified during this process with a representative valve assembly will also apply to like Category 1, 2 or 3 assemblies.

RAI 15.c Describe the pedigree of design information collected for Category 1, 2, and 3 AOVs.

Response:

Design information will be collected as follows:

Category 1 and 2

10 CFR 50 Appendix B or Commercial Grade dedication.

Category 3

In general, a rigorous design basis capability will not be performed for Category 3 AOV assemblies unless an issue is identified with a representative assembly from the Category 1 or 2 evaluation. However, the existing design basis will be validated using Commercial Grade dedication.

RAI 15.d Clarify the periodic testing and setpoint control that will be conducted that monitor potential degradation of operating requirements and actuator output for Category 1, 2, and 3 AOVs, including use of industry-wide degradation evaluation programs.

Response:

In general, the DBNPS proposes to take credit for periodic cycling using the guidance provided in the JOG AOV Program Section 4.3.2. However, for those Category 1, 2 or 3 AOV assemblies that are not cycled at or near design basis conditions, the DBNPS proposes the following periodic test strategies.

Periodic Testing: Category 1

The DBNPS proposes to use a mix of static and dynamic testing as outlined in the JOG AOV Program Table 4-2 to monitor potential degradation and actuator output of Category 1 AOVs at a performance-based frequency not to exceed two cycles in a group. Industry based degradation mechanisms, such as provided by the JOG Periodic Verification for MOVs, may be used in lieu of in-situ dynamic testing. The initial frequency, after the establishment of a minimum of one baseline and one periodic test, will be once per cycle in a group.

Periodic Testing: Category 2

The DBNPS proposes to use static testing for those AOV assemblies represented in Category 1 and a mix of static and dynamic testing for those AOV assemblies not represented in Category 1, as outlined in the JOG AOV Program Table 4-2, to monitor potential degradation and actuator output of Category 2 AOVs at a performance-based frequency not to exceed five cycles in a group. Industry based degradation mechanisms, such as provided by the JOG Periodic Verification for MOVs, may be used in lieu of in-situ dynamic testing. The initial frequency, after the establishment of a minimum of one baseline and one periodic test, will be once per three cycles in a group.

Periodic Testing: Category 3

The DBNPS proposes to use static testing to monitor potential degradation and actuator output capability for Category 3 AOVs, as outlined in the JOG AOV Program Table 4-2, to monitor potential degradation and actuator output of Category 3 AOVs at a performance-based frequency not to exceed five cycles in a group. Testing via other plant programs (such as stroke timing) may be used in lieu of the proposed static testing as appropriate.

As a minimum, Category 1, 2 and 3 AOVs will be cycled once per cycle.

Testing will occur within a group on a staggered basis. However, even though each AOV in a group will be tested over the test interval, the DBNPS may choose to test an assembly within a group repeatedly to monitor for potential degradation.

Setpoint Control: Category 1, 2 and 3

The DBNPS proposes to control the following setpoints:

Regulator setting
Bench Set
Travel

RAI 15.e Clarify the pre- and post-maintenance testing that will be conducted for monitoring Category 3 AOVs.

Response:

Pre-maintenance testing:

The DBNPS proposes to perform pre-maintenance testing of Category 3 AOVs at their discretion to justify modifications to established preventive maintenance intervals.

Post-maintenance testing:

The DBNPS proposes to perform post maintenance testing of Category 3 AOVs for validation of setpoints except where stroke timing is selected.

RAI 15.f Clarify acceptance criteria for Category 1, 2, and 3 AOVs, including FSAR-required stroke times.

Response:

The DBNPS RI-AOV Program does not supersede the requirement to perform FSAR-required stroke timing.

Acceptance Criteria: Category 1

Stroke Time
Setpoints
Margin

Acceptance Criteria: Category 2

Setpoints
Margin

Acceptance Criteria: Category 3

Setpoints except where stroke timing is selected

RAI 15.g Clarify the grouping of AOVs to share information on design-basis capability and periodic test feedback for Category 1, 2, and 3 AOVs.

Response:

The DBNPS proposes to group like Category 1, 2 and 3 AOV assemblies based upon valve type, actuator type, manufacturer and service conditions.

RAI 15.h Discuss the diagnostic data that will be monitored for Category 1, 2, and 3 AOVs.

Response:

The DBNPS proposes to monitor thrust or torque as applicable via diagnostic testing of Category 1, 2 and 3 AOV assemblies.

RAI 15.i Discuss the collection of information prior to extending test intervals as a performance-based approach.

Response:

Category 1 and 2

The DBNPS proposes to complete the design basis capability review (i.e.,one baseline and one periodic test) prior to extending test intervals. The initial extension will be one cycle for Category 1 AOV assemblies and three cycles for Category 2 assemblies.

Category 3

DBNPS proposes to validate the existing design basis (i.e., one baseline and one periodic test) prior to extending test intervals. Category 3 AOV assemblies will be extended to the maximum frequency with no interim frequency.

RAI 15.j Provide a list of the Category 1, 2, and 3 AOVs with actuator and valve manufacturer; valve type, size, and rating; actuator type and model; and differential pressure, flow, and temperature conditions.

Response:

This list will be submitted separately electronically by August 10, 2001.

RAI 15.k Does DBNPS have any air-operated dampers and/or air-operated, testable check valves? Are any of these components included in the DBNPS RI AOV Program? If so, discuss how DBNPS plans to address these components under the DBNPS RI AOV Program.

Response:

The DBNPS does have air-operated dampers and air-operated check valves. Several air operated dampers are included in the DBNPS RI-AOV Program Category 3; however, there are no air-operated, testable check valves in the DBNPS RI-AOV Program. DBNPS plans to take credit for the existing testing and preventive maintenance program for dampers to satisfy the DBNPS RI-AOV Program requirements.

COMMITMENT LIST

The following list identifies those actions committed to by the Davis-Besse Nuclear Power Station (DBNPS) in this document. Any other actions discussed in the submittal represent intended or planned actions the DBNPS. They are described only for information and are not regulatory commitments. Please notify the Manager - Regulatory Affairs (419-321-8450) at the DBNPS of any questions regarding this document or associated regulatory commitments.

COMMITMENTS	DUE DATE
[From RAI 9.a] AOV CC1471 and its redundant train AOV, CC1474, will be modified. Until this modification is implemented, which removes the air from the actuator and fails it in its safety-related position, these AOVs will be treated as Category 1 in the DBNPS RI-AOV Program. After the modification, these two AOVs will become manual, passive AOVs and by definition, will be treated as Category 3 in the DBNPS RI-AOV Program. Failure modes and effects of the modified AOV will be determined and the appropriate operational readiness strategies for Category 3 AOVs will apply.	April 1, 2002
[From RAI 10] The DBNPS concurs that the worksheet incorrectly identifies in the compensatory action statement that DH14B is in Category 2. The worksheet will be revised to reflect that DH14B is Category 1.	April 1, 2002
[From RAI 15.j] A list of the Category 1, 2, and 3 AOVs with actuator and valve manufacturer; valve type, size, and rating; actuator type and model; and differential pressure, flow, and temperature conditions will be provided electronically.	August 10, 2001