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L-03-174

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555-0001

Subject: **Beaver Valley Power Station (BVPS), Unit No. 1 and No. 2**
BV-1 Docket No. 50-334, License No. DPR-66
BV-2 Docket No. 50-412, License No. NPF-73
Risk-Informed Inservice Inspection Program Relief Request
(TAC Nos. MB5687 and MB5688)

References:
1) FirstEnergy Nuclear Operating Company (FENOC) submittal of a relief request to allow implementation of a Risk-Informed Inservice Inspection (ISI) Program as an alternative to the current ASME Section XI requirements for piping at BVPS Unit 1 and Unit 2 (letter L-02-066 dated July 24, 2002)
2) NRC Request for Additional Information (RAI) (Questions #1 - 16) dated December 30, 2002
3) FENOC response to RAI (Questions #1 - 16) (letter L-03-016 dated February 18, 2003)
4) NRC RAI (Question #17) dated February 6, 2003
5) NRC Summary of 7/10/03 Conference Call, dated August 21, 2003
6) FENOC updated response to Question #17 (letter L-03-116 dated August 22, 2003)

On August 22, 2003, FENOC submitted an updated response (Reference 6) to an NRC RAI (Reference 4) regarding the FENOC submittal of a relief request to allow implementation of a Risk-Informed ISI Program at BVPS (Reference 1). That response to RAI Question #17 was, in part, based on a conference call between BVPS personnel and the NRC staff held on July 10, 2003, in which additional details were requested.

The NRC also indicated in that conference call that the initial BVPS response (Reference 3) to RAI Question #7, associated with multiple size piping in the same segments (Reference 2), should be further clarified. (see Reference 5.) As explained in Reference 6, specific information to respond to Question #7 in greater detail was under development and would be submitted by October 29, 2003.

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Additional plant-specific information has now been incorporated into the response to RAI Question #7. This updated response is provided as Enclosure 1 to this submittal.

With this updated response, all requests for information regarding this relief request have now been addressed. This submittal should enable the NRC to complete its review of the subject relief request.

Enclosure 2 provides a list of the regulatory commitments made in this submittal. If there are any questions concerning this matter, please contact Mr. Larry R. Freeland, Manager, Regulatory Affairs/Performance Improvement at 724-682-5284.

Sincerely,

L. W. Pearce

L. William Pearce

Enclosures

c: Mr. T. G. Colburn, NRR Senior Project Manager
Mr. P. C. Cataldo, NRC Sr. Resident Inspector
Mr. H. J. Miller, NRC Region I Administrator

Enclosure 1

Additional Information Regarding
Beaver Valley Power Station (BVPS) Units 1 and 2
Risk-Informed Inservice Inspection (RI-ISI) Program Relief Request

The Request for Information, dated December 30, 2002, provided the following item to be addressed:

A. UNITS 1 AND 2

7. ***Are there any piping segments that include piping of different diameters? If so, how were the failure frequencies estimated for these segments? For segments including piping of different diameters and where the Perdue method could be applied, how were the number of locations to be inspected determined? How does the methodology for determining the failure frequency comport with the methodology described on page 71 of the Westinghouse Owners Group WCAP-14572, Revision 1-NP-A, "Westinghouse Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report," (WCAP-14572), dated February 1999? How does the methodology for determining the number of inspections comport with the methodology described on pages 170, 171, and 174 of the WCAP?***

Additional plant-specific information has been incorporated into the original BVPS response for RAI Question #7:

<u>**Updated Response:**</u>

This NRC request was split into three sub-questions.

7a. ***Are there any piping segments that include piping of different diameters?***

<u>Response</u>

Multiple piping diameters were included in some of the piping segments. Failure consequences were the primary factor utilized to initially divide systems into piping segments. This method led to some individual piping segments consisting of piping with a variety of pipe diameters. For example, a four-inch diameter pipe with a two-inch diameter branch line may be part of the same piping segment if a failure at any portion of the segment would result in the same consequences. For multiple pipe size segments, sub-segments were defined by pipe size for the failure probability analysis.

7b. ***If so, how were the failure frequencies estimated for these segments? How does the methodology for determining the failure frequency comport with the methodology described on page 71 of the Westinghouse Owners Group WCAP-14572, Revision 1-NP-A, "Westinghouse Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report," (WCAP-14572), dated February 1999?***

Response

Failure probability estimates were generated for the piping segments using the Westinghouse Structural Reliability and Risk Assessment Model (Win-SRRA). Some of the input parameters used by the Win-SRRA code vary if the diameter of the pipe varies (e.g., nominal pipe size, thickness to outer diameter ratio). Failure probability estimates for segments made up of multiple pipe sizes were determined by performing multiple Win-SRRA cases. For the multiple pipe diameter cases that resulted in multiple failure probability estimates, the highest failure probability associated with the segment was then used to represent the segment.

For each of these cases the Win-SRRA code utilized 18 input parameters associated with the piping. For segments with multiple pipe sizes, some of the input parameters varied from case to case even though they represented the same segment. Different pipe diameters required different inputs for a number of the parameters. Other inputs also occasionally varied based on expert engineering judgment. Beaver Valley subject matter experts in ISI, NDE, materials, and pipe stress analysis (i.e. engineering panel) worked together to develop the input parameters for each Win-SRRA code case run. Therefore, each case represented a sub-segment and was evaluated for the expected conditions for the sub-segment.

In accordance with the WCAP methodology, the engineering panel developed limiting inputs for the evaluation of each segment or sub-segment. Input parameters may have varied for separate portions of the same segment for one of two reasons. One reason was that some segments contained multiple weld geometries (both butt and socket welds). In these segments, specific geometries were reviewed and different parameters were input to accurately model the geometry. In a few cases, the input parameters for sub-segments varied slightly based on engineering judgment. For these cases, the inputs were developed by plant subject matter experts and were based on observed and recorded conditions. The basis for each judgment is documented in the Beaver Valley Win-SRRA engineering analyses. Though the input parameters for different cases of the same segment may vary, the parameters that were chosen for each case were the most limiting for that section of the piping segment. The limiting failure probability estimates associated with each pipe size for each segment are based on the realistic limiting inputs associated with that section of piping. For segments with multiple line sizes, multiple failure probabilities were determined and the most limiting (highest) failure probability associated with the segment was used to represent the segment.

As shown in Figure 3.5-1 and accompanying text in the approved WCAP (WCAP-14572, Rev. 1-NP-A, Feb. 1999), failure probability estimation is the responsibility of the engineering team based upon their knowledge of the pertinent information at their plant and any potential concerns identified from industry experience at other plants. For example, PWR plants have recently evaluated the increased potential for stress corrosion cracking at the reactor vessel outlet nozzle weld based upon the weld crack at the V. C. Summer plant. The SRRA tool is used to simply quantify the effects of the engineering team's input on the calculated leak and break probabilities. In fact, the second concern of the summary and conclusions (Section A.25 on page A-21) of the Nuclear Regulatory Commission (NRC) safety evaluation (SE) for the SRRA tool (Supplement 1 to the approved WCAP) endorses this position via the following:

> "The results of SRRA calculations should always be reviewed to ensure that they are reasonable and consistent with plant operating experience. Data from plant operation should be used to review and refine inputs to calculations."

Choosing the limiting SRRA probabilities from the sub-segments of different sizes in a segment is consistent with the NRC approved methodology in the WCAP. The fifth item in the section of the NRC SE discussed above states:

> "The simplified nature of the SRRA code has resulted in a number of conservative assumptions and inputs being used in applications of the code. It is therefore recommended that sensitivity calculations be performed to ensure that excessive conservatism does not unrealistically impact the categorization and selection of piping locations to be inspected."

The methodology on how the degradation mechanisms in the different sized sub-segments are to be "combined" is consistent with the approved methodology as stated in the last paragraph of Section 3.2.3, Piping Failure Potential, of the NRC SER and in Section 3.2, Simplified and Detailed Input (page 16, paragraph 3), in Supplement 1 of the WCAP:

> "If more than one degradation mechanism is present in a given piping segment, then the limiting input values for each mechanism should be combined so that a limiting failure probability is calculated for risk ranking."

As indicated on page 84 in Section 3.5.6, Failure Probability Determination, of the approved WCAP, combining degradation mechanisms does not imply adding the failure probabilities for each mechanism. Typically, one degradation mechanism will dominate the failure probability in the segment by several orders of magnitude. Multiple nominal pipe sizes in a single segment arise due to the establishment of initial segment boundaries based on consequence considerations as detailed on page 57 of the approved WCAP. An appropriate tool must be used to determine the failure impact of the potential degradation mechanisms to determine the dominant mechanism for the segment. As discussed above, the SRRA tool was used in the calculation of failure probability estimates for Beaver Valley. As detailed in the supplement to the WCAP, multiple factors must be considered in determining the piping failure including:

1. degradation mechanisms,
2. construction examinations and practice,
3. preservice and inservice inspection history,
4. physical routing and configuration.

Table 3.5-1 of the WCAP and pages 1-1 and 1-2 of the WCAP supplement provide guidelines for items to consider when determining pipe failure. In Section 3.5.4 the estimated failure probability is identified as being dependent on and significantly influenced by the following four items: configuration, components, materials/chemistry and loads.

A degradation mechanism's affect may vary based on the different physical configurations of the weld or welds. Socket welds are particularly noted as having low resistance to sustained vibration. It is also noted in Section 3.5.4 of the WCAP that interactions among the factors are common. A distinction is made in the discussion between component dependent failure modes, which are typically identified as localized within a segment and material dependent or operational dependent mechanisms, which may be present throughout the entire segment. This distinction is consistent with Section 3.5 (page 71, paragraph 2), which states:

> "The failure probability of a segment is characterized by the failure potential (probability or frequency as appropriate) of the worst case situation in each segment (not a single selected weld in each segment)."

Consider the following two hypothetical examples based on typical situations and calculated probabilities experienced by plant engineering teams for SRRA input:

Example 1: Significant Differences In Pipe Sizes and Potential Degradation Mechanisms

In this example segment for high temperature and pressure piping, a 6-inch sub-segment extends some distance from a check valve to a tee, where the flow is split into two three-inch sub-segments that each extend to a pump. Due to water hammer that has occurred in this system at other plants, a one-inch sub-segment was added at the high-points (near each pump) of the 3-inch piping to periodically vent the system. If the check valve leaked, then the weld in the 6-inch sub-segment closest to the valve could experience thermal stratification. Although there is no evidence that the check valve is leaking in this specific case, it has happened in similar plants so a high fatigue stress range and number of cycles for stratification is selected by the team for the simplified SRRA input. Because of the geometric layout of the piping, a weld in the 3-inch portion would see the highest water-hammer loading, which the team estimated only had a 1% chance of occurring due to the corrective actions that had already been implemented. Another weld in the same size piping also had a pre-service inspection indication that was small enough that a repair was not required per the American Society of Mechanical Engineers (ASME) Code. Because some imbalance of the pump was observed after the one-inch vent was installed, there is a concern for the potential effects of vibration in the three-inch pipe welds but especially in the 1-inch pipe socket welds nearest to the pumps. All the piping in the segment is subject to fatigue loading due to normal heat-up and cool-down and periodic pump testing. The consequence of failure is loss of inventory and the system disabling leak rate has been conservatively assumed to be 2 GPM for all three pipe sizes in the segment.

The SRRA calculated large-leak probabilities after 40 years are as follows:
a) 3.3E-05 for the 6-inch pipe with thermal stratification,
b) 1.5E-05 for the 3-inch pipe with one-flaw, vibration (input corrected for size by SRRA Program) and a 1% chance of a severe water hammer,
c) 5.0E-04 for 1-inch pipe with vibration (correction factor of 1),
d) 4.0E-02 for 1-inch pipe with thermal stratification, one-flaw, vibration and a 1% chance of a severe water hammer.

The SRRA probability of 5.0E-04 should be selected by the engineering team for risk ranking because the probability of option d) is unduly conservative relative to plant and industry experience. The SRRA input for option d) would also be completely unrealistic relative to assuming the same 6-inch stratification loading near the check valve in the 1-inch line far away from the valve and the worst 3-inch water hammer loading in a 1-inch branch line.

Example 2: Small Differences In Pipe Sizes and Potential Degradation Mechanisms

In this example segment for moderate temperature and pressure, three different pipe sizes are also used (NPS of 1, 1.5 and 2 inch). All the piping in the segment is subject to fatigue loading due to normal heat-up and cool-down and relatively high seismic (SSE) loading for the design-limiting event. The consequence of failure is loss of the system function and disabling leak rate has been conservatively assumed to be 10% of the flow through the largest of the three pipe sizes in the segment.

The SRRA calculated large-leak probabilities after 40 years for this example are as follows:
a) 8.9E-05 for the 2-inch pipe with its fatigue and SSE loading,
b) 1.2E-06 for the 1.5 inch pipe with its fatigue and SSE loading,
c) 7.5E-07 for 1-inch pipe with its fatigue and SSE loading,
d) 9.1E-05 for the 2-inch pipe with the highest fatigue and highest SSE loading independent of pipe size.

The SRRA probability of 9.1E-05 would be selected by the engineering team for risk ranking because the probability of option d) is not overly conservative relative to plant and industry experience and the SRRA input would still be realistic relative to the uncertainties in the actual loading for the different pipe sizes (i.e., the difference between the SRRA calculated probability values of 8.9E-05 and 9.1E-05 is not statistically significant).

It is our position that assessing the unique input parameters based on the configuration, components, materials/chemistry, and loads by distinct quantification of all of the potential degradation in regards to localized and generalized degradation mechanisms in the entire segment fully comports with the safety evaluation requirement stated below:

> "...ensure that excessive conservatism does not unrealistically impact the categorization and selection of piping locations to be inspected"

The consistency in the items used in determining the critical location or locations for inspection is supported by the requirement in WCAP Section 3.7.3. This section identifies that the selection of inspection location be based on the postulated failure mechanisms and the loading conditions for the piping segment considering the same four items as in the determination of piping failure, namely: configuration, components, materials/chemistry and loads.

Furthermore the inspection is not limited to a single degradation mechanism but must consider all possible mechanisms contributing to the potential pipe failure for a given segment at the most likely location of occurrence.

It is therefore our conclusion that the process followed in sub-dividing consequence defined segments in addressing the previously identified four items fully supports the directive to apply all possible degradation mechanisms at a single weld and ensure that there is no excessive conservatism on the piping categorization or selection of inspection location.

As described above, Beaver Valley believes that it has followed the process prescribed in Westinghouse Owners Group (WOG) WCAP-14572, Revision 1-NP-A, "Westinghouse Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report," (WCAP-14572), dated February 1999. A conference call between the NRC staff, WOG, Westinghouse, and several licensees was held on February 20, 2003 to discuss the NRC concerns associated with the application of the WCAP-14572 Revision 1-NP-A methodology relative to multiple pipe size segments. During the conference call, the NRC Staff indicated a concern about a potential difference in the interpretation of the methodology for multiple pipe size segments and in the number of examinations on the segment when the highest failure probability of a sub-segment is used to represent the failure probability of the multiple pipe size segments.

To address the concern associated with the high safety significant (HSS) multiple pipe size segments, all the HSS multiple pipe size segments were evaluated to determine if there would be any difference in the number of examinations.

To address the concern associated with a the low safety significant (LSS) multiple pipe size segments, each LSS multiple pipe size segment that had an ASME Section XI examination on more than one size was assumed to be split into separate sub-segments. The number of sub-segments was equal to the number of sizes for which there was an ASME Section XI examination. Credit for the ASME Section XI examinations was assigned to these sub-segments and the change-in-risk calculations were rerun.

Beaver Valley Unit 1 has 156 multiple pipe size segments. Twenty-nine of these multiple pipe size segments are HSS and the remaining 127 multiple pipe size segments are LSS. Had the RI-ISI program been done per the NRC interpretation of WCAP-14572, there is a potential difference of 1 examination associated with segment SI-042A in the Beaver Valley Unit 1 RI-ISI program. The difference in SRRA inputs, thickness to outside diameter ratio and residual stress level, are based on three different pipe schedules for the same nominal pipe size. There is no difference in modeling due to degradation. Segment SI-042A passed the Perdue model for the region 1B welds, however to remove any concern, one additional examination will be added to segment SI-042A for a total of 3 examinations (one 1A examination and two 1B examinations) in the Beaver Valley Unit 1 RI-ISI program. Table 2-1 summarizes the evaluation of the Beaver Valley Unit 1 HSS multiple pipe size segments.

As a result of our investigation, there are no additional examinations from the LSS multiple size segments, because there are no multiple pipe size segments at Beaver Valley Unit 1 with an ASME Section XI examination on more than one size.

Table 2-1 Summary of the Evaluation of the HSS Multiple Pipe Size Segments at Beaver Valley Unit 1

(Number of Segments) Segment IDs	**Change in Number of Exams**	**Basis**
(16) CH-004, CH-016, CH-017, CH-018, CH-026, CH-095, CH-096, CH-097, CH-102, CH-103, CH-104, RC-004, RC-005, RC-006, RH-004, RH-028	0	The only differences in the SRRA inputs are associated with the physical pipe dimensions (nominal pipe size and thickness to outside diameter ratio). Since multiple pipe size segments are acceptable per WCAP-14572 Rev. 1-NP-A, these multiple pipe size segments do not need to be split. Therefore there is no difference in the number of examinations in these segments.
(1) CH-050A	0	This segment is comprised of socket welded piping. Splitting the segment would have no effect on the number of examinations as the segment is examined via a VT-2 examination. There is no externally initiated degradation mechanism associated with this socked welded piping.

Table 2-1 Summary of the Evaluation of the HSS Multiple Pipe Size Segments at Beaver Valley Unit 1		
(Number of Segments) Segment IDs	**Change in Number of Exams**	**Basis**
(6) RC-067, RH-005, RH-006, RS-032, RS-033, SI-043A	0	For these segments, changing the SRRA inputs to the bounding inputs from all the various sizes in the segment (i.e. combining the worst degradation mechanisms from all sizes on a single weld) results in approximately the same failure probability. Thus there is no need to split the segment and there is no difference in the number of examinations for these segments.
(1) MS-026	0	For this segment, changing the SRRA inputs to the bounding inputs from all the various sizes in the segment results in a higher failure probability on one of the pipe sizes. However, the increased failure probability on this pipe size is still not high enough to be the controlling failure probability for the segment. The controlling failure probability for the segment remained the same. Therefore there is no need to split the segment and there is no difference in the number of examinations for this segment.
(4) RS-009, RS-010, RS-030, RS-031	0	For these segments, changing the SRRA inputs to the bounding inputs from all the various sizes in the segment has the following results. There is an increase in the controlling failure probability on one of the pipe sizes; however, the increased failure probability on this pipe size is still not high enough to be the controlling failure probability on the segment. The controlling failure probability on the pipe size with the controlling failure probability for the segment remained approximately the same. Therefore there is no need to split the segment and there is no difference in the number of examinations on these segments.

Table 2-1 Summary of the Evaluation of the HSS Multiple Pipe Size Segments at Beaver Valley Unit 1		
(Number of Segments) Segment IDs	**Change in Number of Exams**	**Basis**
(1) SI-042A	1	For this segment, changing the SRRA inputs to the bounding inputs from all the various sizes in the segments results in an increase in the controlling failure probability for the segment. The increased failure probability represents an unrealistic and overly conservative condition and should not be used. The segment is comprised of a single nominal pipe size with three different schedules. Two of the three schedules in this segment contain the same SRRA inputs except the thickness to outside diameter ratio. The difference in SRRA inputs for the third schedule is associated with the residual stress level which is based on schedule. If the multiple pipe size segment were split, it would be split into two sub-segments. Given that the failure probabilities for all three schedules are similar and the high risk reduction worth (RRW) for the multiple pipe size segment, it is reasonable to assume that the two sub-segments would also have high RRWs and be HSS. From the Perdue analysis, the multiple pipe size segment is region 1 with one examination in region 1A and one examination in region 1B. If the segment were split, it is reasonable to assume that the one sub-segment would be region 1 and the other Region 2. The region 1 sub-segment would have one region 1A examination and a minimum of one region 1B examination. The region 2 sub-segment would have a minimum of one region 2 examination. Thus there is a difference of one examination.

Beaver Valley Unit 2 has 179 multiple pipe size segments. Thirty-two of these multiple pipe size segments are HSS and the remaining 147 are LSS. Had the RI-ISI program been done per the NRC interpretation of WCAP-14572, there would be no change in the number of examinations in the Beaver Valley Unit 2 RI-ISI program. Table 2-2 summarizes the evaluation of the Beaver Valley Unit 2 HSS multiple pipe size segments.

Where there is an ASME Section XI examination on more than one size in a Beaver Valley Unit 2 LSS segment, splitting the segments into sub-segments met the change-in-risk criteria with no additional examinations. Therefore, no additional examinations were identified from the LSS multiple pipe size segments.

Table 2-2 Summary of the Evaluation of the HSS Multiple Pipe Size Segments at Beaver Valley Unit 2

(Number of Segments) Segment IDs	Change in Number of Exams	Basis
(23) CHS-005, CHS-006, CHS-007, CHS-019A, CHS-020A, CHS-021A, CHS-026A, CHS-026C, CHS-026G, CHS-028C, CHS-050A, MSS-004, MSS-005, MSS-006, MSS-026, QSS-005, QSS-006, QSS-035, SIS-022A, SIS-043A, SIS-061B, SIS-062B, SIS-065A	0	The only differences in the SRRA inputs are associated with the physical pipe dimensions (nominal pipe size and thickness to outside diameter ratio). Since multiple pipe size segments are acceptable per WCAP-14572 Rev. 1-NP-A, these multiple pipe size segments do not need to be split. Therefore there is no difference in the number of examinations in these segments.
(5) QSS-026, QSS-027, SIS-056A, SIS-057B, SIS-064A	0	The differences in the SRRA inputs are associated with butt welded piping versus socket welded piping. Splitting the segment between the butt welded piping and the socket welded piping would have no effect on the number of examinations. The socket welds would be examined via VT-2 examination. The number of examinations on the butt welded portion would be determined in the same manner whether the segment were split or left as a multiple pipe size segment. Therefore there is no difference in the number of examinations in these segments. There is no externally initiated degradation mechanism associated with this socked welded piping.

Table 2-2 Summary of the Evaluation of the HSS Multiple Pipe Size Segments at Beaver Valley Unit 2		
(Number of Segments) Segment IDs	**Change in Number of Exams**	**Basis**
(2) RCS-058, RCS-067	0	For these segments, changing the SRRA inputs to the bounding inputs from all the various sizes in the segment (i.e. combining the worst degradation mechanisms from all sizes on a single weld) results in approximately the same failure probability. Thus there is no need to split the segment and there is no difference in the number of examinations in these segments.
(2) QSS-003, QSS-004	0	For these two segments, one size in the segment had received a radiographic examination after the last weld pass where the other size had not. Conservatively assuming that the size that had a radiographic examination did not have a radiographic examination results in an increase in the failure probability for that size. However this revised failure probability is approximately the same as the failure probability for the size that actually did not receive a radiographic examination. The failure probability for the size that actually did not receive a radiographic examination is the controlling failure probability for the multiple pipe size segments. Thus there is no need to split the segments and there is no difference in the number of examinations for these segments.

In conclusion, the evaluation to address this NRC RAI indicates one potential additional examination for Beaver Valley Unit 1 based solely on a different residual stress level dictated by pipe schedule. Since the residual stress level input does not represent a degradation mechanism, there is no difference in examinations due to degradation mechanisms. However, to remove any concern, one additional examination will be added to Beaver Valley Unit 1 segment SI-042A.

7c. ***For segments including piping of different diameters and where the Perdue method could be applied, how were the number of locations to be inspected determined? How does the methodology for determining the number of inspections comport with the methodology described on pages 170, 171, and 174 of the WCAP?***

Response

The Perdue Model is used to aid in the determination of the number of inspection locations for segments determined to be high safety significant by the plant RI-ISI expert panel. Segments were divided into sub-segments (or lots) during the Perdue Model evaluation using the following cases:

Case A: There is an identified active degradation mechanism and the segment is placed in Region 1 of WCAP-14572 Figure 3.7-1.

For this case, the piping in the segment is the same nominal diameter. One lot consists of the welds/locations susceptible to the degradation mechanism (Region 1A). Each susceptible location is included in the inspection program if it is not already part of an augmented inspection program. Welds/locations which are included in an augmented program remain in that program and are inspected in accordance with that program. The other lot consists of the rest of the welds in the segment (Region 1B). These are evaluated with the Perdue Model based on SRRA parameters which exclude the active degradation mechanism. The total number of inspections for the segment is the sum of the susceptible locations plus the number of inspections required to achieve a 95% confidence using the Perdue Model (a minimum of one location is specified even if the Perdue Model shows 100% confidence with no ISI). This is consistent with the description of segments in Region 1 on page 168 of WCAP-14572.

Case B: There is no identified active degradation mechanism and the segment has been placed in Region 2 of WCAP-14572 Figure 3.7-1.

For this case, there are multiple pipe sizes in the segment. The Perdue Model inputs are specific to the pipe material and size. The first approach is to combine the most limiting inputs from each pipe size, use the total number of welds in the segment, and analyze the segment as one lot. Alternatively, if this analysis does not result in a 95% confidence level, then each pipe size is analyzed separately with the appropriate number of welds and the appropriate SRRA results. This divides the segment into lots according to pipe size. The confidence values of each lot are multiplied together to get the confidence for the segment. The resulting confidence level must be greater than or equal to 95% for the Perdue Model evaluation to be acceptable. The total number of inspections for the segment is the number of inspections required to achieve a 95% confidence using the Perdue Model. A minimum of one location is specified even if the Perdue Model shows 100% confidence with no ISI. This is consistent with the description of segments in

Region 2 on page 168 of WCAP-14572 and with the description of dividing a segment into multiple lots on pages 174 and 175.

Case C: There is an active degradation mechanism and the segment has been placed in Region 1 of WCAP-14572 Figure 3.7-1.

For this case, there are multiple pipe sizes in the segment. One lot consists of the welds/locations susceptible to the degradation mechanism (Region 1A). Each susceptible location is included in the inspection program if it is not already part of an augmented inspection program. Welds/locations which are included in an augmented program remain in that program and are inspected in accordance with that program. For the Perdue Model evaluation of the non-susceptible welds/locations (Region 1B), the steps followed are the same as in Case B above. The first approach is to combine the most limiting inputs from each pipe size after removing the active degradation mechanism, use the total number of welds minus the number of susceptible welds, and analyze the segment as one lot. If this is too conservative, then each pipe size is analyzed separately with the appropriate number of welds and the appropriate SRRA results. The confidence values of each lot are multiplied together to get the confidence for the segment. The resulting confidence level must be greater than or equal to 95% for the Perdue Model evaluation to be acceptable. The total number of inspections for the segment is the sum of the susceptible locations plus the number of inspections required to achieve a 95% confidence using the Perdue Model (a minimum of one location is specified even if the Perdue Model shows 100% confidence with no ISI). This is consistent with the description of segments in Region 1 on page 168 of WCAP-14572 and with the description of dividing a segment into multiple lots on pages 174 and 175.

Individual Perdue Model inputs are specific to the pipe material and size. Therefore, segments with multiple sizes must be evaluated in one of the three ways discussed. In all three approaches, the method for evaluating segments with the Perdue Model fully complies with the approved methodology.

ENCLOSURE 2

Commitment List

The following list identifies those actions committed to by FirstEnergy Nuclear Operating Company (FENOC) for Beaver Valley Power Station (BVPS) Unit No. 1 in this document. Any other actions discussed in the submittal represent intended or planned actions by Beaver Valley. These other actions are described only as information and are not regulatory commitments. Please notify Mr. Larry R. Freeland, Manager, Regulatory Affairs/Performance Improvement, at Beaver Valley on (724) 682-5284 of any questions regarding this document or associated regulatory commitments.

Commitment	Due Date
One additional examination will be added to segment SI-042A for a total of 3 examinations (one 1A examination and two 1B examinations) in the Beaver Valley Unit 1 RI-ISI program	Upon implementation of proposed RI-ISI program