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James H. Lash
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724-682-7773

September 6, 2005
L-05-146

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

Subject: Beaver Valley Power Station, Unit Nos. 1 and 2
BV-1 Docket No. 50-334, License No. DPR-66
BV-2 Docket No. 50-412, License No. NPF-73
Response to Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors"

This letter provides the FirstEnergy Nuclear Operating Company (FENOC) response for the Beaver Valley Power Station to Generic Letter 2004-02, which requests addressees to perform a mechanistic evaluation of the potential for the adverse effects of post-accident debris blockage and operation with debris-laden fluids to impede or prevent the recirculation functions of the emergency core cooling system (ECCS) and containment spray system (CSS) following all postulated accidents for which the recirculation of these systems is required. With regard to this evaluation the generic letter requested two responses, the first due within 90 days of the date of the safety evaluation report providing guidance for the evaluation (ref. response letter L-05-034, dated March 4, 2005), and the second due no later than September 1, 2005.

Attachment 1 to this letter provides the information requested no later than September 1, 2005. Attachment 2 provides a list of regulatory commitments made in this submittal.

If there are any questions concerning this matter, please contact Mr. Henry L. Hegrat, Supervisor - Licensing, at 330-315-6944.

A116

I declare under penalty of perjury that the foregoing is true and correct. Executed on September 1, 2005.

Sincerely,

James H. Lash

Attachments:
1. Response to Generic Letter 2004-02, Requested Information Item 2
2. List of Regulatory Commitments

c: Mr. T. G. Colburn, NRR Senior Project Manager
Mr. P. C. Cataldo, NRC Senior Resident Inspector
Mr. S. J. Collins, NRC Region I Administrator
Mr. D. A. Allard, Director BRP/DEP
Mr. L. E. Ryan (BRP/DEP)

ATTACHMENT 1

Response to Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors"

NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," requires that Pressurized-Water Reactor (PWR) licensees provide information on the planned actions and schedule for mechanistically evaluating the potential for the adverse effects of post-accident debris blockage and operation with debris-laden fluids to impede or prevent the recirculation functions of the Emergency Core Cooling System (ECCS) and Containment Spray System (CSS).

The items requested in Requested Information Item 2 of GL 2004-02 and the Beaver Valley Power Station (BVPS) response appear below:

2(a)

Confirmation that the ECCS and CSS recirculation functions under debris loading conditions are or will be in compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of this generic letter. This submittal should address the configuration of the plant that will exist once all modifications required for regulatory compliance have been made and this licensing basis has been updated to reflect the results of the analysis described above.

Response 2(a)

Activities are in progress to confirm that the ECCS and Recirculation Spray System (RSS) recirculation functions under debris loading conditions at BVPS-1 and BVPS-2 will be in compliance with the regulatory requirements as listed in the generic letter following completion of design analyses and modifications. At BVPS, the recirculation spray system provides the CSS recirculation function.

The following activities have been undertaken in order to demonstrate compliance with the regulatory requirements of the generic letter:

1) Containment debris source walkdowns
2) Debris generation and transport analyses
3) Debris bed head loss evaluation
4) Available net positive suction head (NPSH) analysis
5) Downstream effects evaluations
6) Evaluation of necessary procedural modifications.
7) Interim qualitative assessment of margin to address chemical effects

In addition to the above activities, prototype testing of the replacement sump strainer is planned. This prototype testing will determine the debris bed head loss for the proposed strainer design using the unit specific debris loading conditions determined in the debris generation and transport analyses.

Design activities, including structural analyses, are being undertaken to physically modify the sump screen configuration for both BVPS units. These modifications are scheduled for implementation during the BVPS-2 fall 2006 refueling outage (2R12) and during the BVPS-1 fall 2007 refueling outage (1R18). The replacement sump strainers for both units will be of a passive, complex geometry design. In addition to the replacement of the sump screens, a modification is to be implemented for both units that would allow sufficient pool depth to cover the sump strainers for all analyzed breaks before initiating recirculation flow. At BVPS-1 some fibrous and calcium-silicate insulation is being replaced during the spring 2006 refueling outage (1R17) with the planned replacement of the steam generators.

Additional modifications, including replacement of calcium silicate insulation, may be necessary pending the outcome of prototype testing. The extent and necessity of the modifications will be determined once prototype testing is complete.

The licensing basis for BVPS-1 and BVPS-2 will be updated to reflect the results of the analyses and modifications performed to demonstrate compliance with the regulatory requirements. At BVPS-2, containment overpressure will need to be credited as is done at BVPS-1.

2(b)

A general description of and implementation schedule for all corrective actions, including any plant modifications, that you identified while responding to this generic letter. Efforts to implement the identified actions should be initiated no later than the first refueling outage after April 1, 2006. All actions should be completed by December 31, 2007. Provide justification for not implementing the identified actions during the first refueling outage starting after April 1, 2006. If all corrective actions will not be completed by December 31, 2007, describe how the regulatory requirements discussed in the Applicable Regulatory Requirements section will be met until the corrective actions are completed.

Response 2(b)

The following activities have been undertaken in order to demonstrate compliance with the regulatory requirements of the generic letter:

1) Containment debris source walkdowns
2) Debris generation and transport analyses
3) Debris bed head loss evaluation
4) Available NPSH analysis
5) Downstream effects evaluations
6) Evaluation of necessary procedural modifications
7) Interim qualitative assessment of margin to address chemical effects

Based on the evaluations and analyses, conceptual designs have been developed for new emergency sump strainers to replace the existing emergency sump screens. These modifications are scheduled for implementation during the BVPS-2 fall 2006 refueling outage (2R12) and during the BVPS-1 fall 2007 refueling outage. If downstream components are found that are susceptible to debris clogging with the new sump strainers, corrective actions would be

implemented during the same outage, if possible. Detailed descriptions of the methodologies used and the proposed modifications are provided in the Response to Request Item 2(c).

Some programmatic controls are being strengthened to maintain the design basis of the ECCS and RSS as it relates to emergency sump recirculation when components supported by the emergency sump are required to be operable per plant technical specifications. These include controls on thermal and sound insulation, engineering changes, plant labels, signs and tags, containment coatings and containment cleanliness.

Analyses will be performed to support a change in the start signal for recirculation spray pumps, which will ensure that the proposed emergency sump strainer will be submerged during the recirculation phase of all postulated events. For BVPS-1, the analysis will also support a change to operating strategy that directs securing of two RSS pumps upon transfer to cold leg recirculation. This will reduce the flow rate through the emergency sump strainer. Implementation of the change in RSS pump start signal is contingent upon approval of the containment conversion license amendment request currently being reviewed by the NRC. The analysis for BVPS-2 will be done to support the changes planned for 2R12 and for BVPS-1 will be done to support the changes planned for 1R18. These are the first refueling outages starting after April 2006.

Two options are being considered for the change to RSS pump start signal. Option 1 involves extending the current time delay for starting the pumps and Option 2 would replace the time delay with a start signal that is based on refueling water storage tank (RWST) level. Option 1 would be implemented at BVPS-1 and at BVPS-2 before December 31, 2007. Since the start signal in Option 2 is more directly connected with containment sump water level, it permits a more compact strainer footprint with greater surface area and greater NPSH margin than would be permitted by the time delay option. A license amendment would be required to implement this option. For BVPS-1, this option would be implemented during 1R18 (Fall 2007). Due to the resources needed to implement this change and timing of the next BVPS-2 outage (2R12, Fall 2006) this modification would be implemented at BVPS-2 during 2R13 (Spring 2008). With either option, the new sump strainer installation would be installed before December 31, 2007. A detailed discussion of changes to the BVPS licensing basis is provided in the Response to Request Item 2(e).

Implementation of Option 2 during the spring 2008 refueling outage at BVPS-2 is requested to allow adequate time to properly design and install the modification and to prepare and obtain NRC approval of the associated license amendment (Refer to Response to Request Item 2(e)). This schedule would exceed, by approximately 3 months, the requested date for implementation of corrective actions (December 31, 2007) specified in the generic letter. This is believed to be justified because the installation of the new strainers will have been completed during 2R12 (Fall 2006). The new strainers will provide design improvements including increased surface area, improved filtering capability and improved structural characteristics. These features improve safety while maintaining compliance to the current licensing basis. Interim compensatory actions described in response to NRC Bulletin 2003-01 would also be maintained until the modifications are completed. The alternative, Option 1, was previously envisioned as the means to ensure adequate sump level, but was recently found to have greatly reduced NPSH margins relative to Option 2 (Refer to Response to Request Item 2(d)(i)).

FENOC intends to perform prototypical testing on the proposed strainer design to validate the results of the debris bed head loss evaluation. It is anticipated that this testing will be completed by the first quarter of 2006. If the results of the prototype testing indicate that a reduction in insulation source term is required, then the subject insulation will be modified or replaced.

FENOC intends to participate in testing that demonstrates that the zone of influence modeled in the qualified coatings debris generation calculation is based on representative test results. This testing is expected to be complete by the first quarter of 2006.

FENOC is also monitoring the joint government and industry sponsored Integrated Chemical Effects Testing (ICET) and follow-on testing to develop a head loss correlation. When the results of the testing become available, they will be assessed to ensure there is no impact on plant operation. An interim qualitative assessment of margin to address chemical effects is included in the Response to Request Item 2(d)(iii).

2(c)

A description of methodology that was used to perform the analysis of the susceptibility of the ECCS and CSS recirculation functions to the adverse effects of post-accident debris blockage and operation with debris-laden fluids. The submittal may reference a guidance document (e.g., Regulatory Guide 1.82, Rev. 3, industry guidance) or other methodology previously submitted to the NRC. (The submittal may also reference the response to Item 1 of the Requested Information described above. The documents to be submitted or referenced should include the results of any supporting containment walkdown surveillance performed to identify potential debris sources and other pertinent containment characteristics.)

Response 2(c)

Analyses are being performed to determine the susceptibility of the ECCS and CSS (RSS at BVPS) recirculation functions to the adverse effects of post-accident debris blockage and operations with debris-laden fluids. These analyses conform to the greatest extent practical with methodology presented in Nuclear Energy Institute Document NEI 04-07, "Pressurized Water Reactor Sump Performance Evaluation Methodology" (hereafter, referred to as NEI 04-07) and modified as necessary by the staff comments provided in the NRC Safety Evaluation Report.

The methodology utilized in NEI 04-07 is comprised of several activities. These activities are:

1) Identification of containment debris source terms and evaluation of potential upstream recirculation water hold-up locations.
2) Debris generation and transport analyses, including refinements to remove excess conservatism.
3) Evaluation of head loss as a result of debris accumulation and comparison with NPSH margin during recirculation operations.
4) Design of a new emergency sump strainer, including structural analysis and changes to as-built plant design.

5) Prototypical testing to validate the new emergency sump strainer design.
6) Reduction of the debris source term by use of debris interceptors or insulation modification/replacement as necessary.
7) Interim qualitative assessment of margin to accommodate integrated chemical effects.
8) Establishment of controls to protect the design basis of the ECCS and RSS function during recirculation. This item is fully discussed in the Response to Request Item 2(f).

Containment Walkdowns

Containment walkdowns were conducted by Enercon Services, Inc. with support from BVPS staff. The walkdowns were conducted in accordance with Enercon procedure BV005-PROC-01, "Containment Walkdown Procedure for Potential Sump Screen Debris Sources at Beaver Valley Power Station Unit 1" and BV005-PROC-02, "Containment Walkdown Procedure for Potential Sump Screen Debris Sources at Beaver Valley Power Station Unit 2." These procedures were developed based on Nuclear Energy Institute Document NEI 02-01, "Condition Assessment Guidelines: Debris Sources Inside PWR Containments." The walkdowns used design drawings to identify potential debris sources. These sources were verified during the walkdowns, and any undocumented sources were identified. The inventory of containment coatings was also identified during the walkdowns. An assessment of the potential for recirculation water hold-up due to debris accumulation was conducted as part of the walkdowns. No holdup locations beyond those already identified in BVPS design documentation were found.

The BVPS-1 walkdown was conducted prior to the issuance of NEI 04-07 and its associated Safety Evaluation Report (SER). Latent debris quantities were estimated based upon the observed conditions. At BVPS-2 latent debris quantities were established based on the guidance provided in NEI 04-07, Section 3.5. Given the similarity of cleanliness between both units as noted by the walkdown teams, it is apparent that the latent debris quantities estimated by the BVPS-1 walkdowns is quite conservative. As a result, the BVPS-1 analysis will assume a debris quantity based on the BVPS-2 latent debris assessment with a margin factor added to account for any potential differences between the two units. A follow-up walkdown to validate the assumed debris quantity will be conducted during 1R17 and the latent debris quantity will be re-evaluated based upon those results.

As committed in the FENOC generic letter response of March 4, 2005 (L-05-034), the walkdown for BVPS-2 was done during the April 2005 refueling outage. The method used for the walkdown was the same as for BVPS-1 except that more recent debris sampling guidelines were able to be applied by the time of the BVPS-2 walkdown (as described previously). BVPS-2 walkdown results are in the final stages of evaluation and reconciliation with preliminary analysis assumptions.

Debris Generation

The Debris Generation analyses are being performed by Alion Science and Technology (ITS Operation). The analyses are being conducted using the methodology described in NEI 04-07, Sections 3.3 and 3.4, and refined as described in Section 4.2, as modified by NRC staff comments in the SER.

The Zone of Influence (ZOI) used in debris generation varies based on the debris type, and the value provided in NEI 04-07 was increased 40% when required as discussed in the SER. Insights from the Ontario Power Group (OPG) calcium silicate debris generation test results (see NEI 04-07, Reference 7) are being utilized in establishing calcium silicate debris quantities. The ZOIs for the various debris types are constrained by robust barriers when appropriate. For qualified coatings, a spherical ZOI equivalent to 5 pipe diameters (5D) is provided in the Debris Generation analysis. This assumption will be validated by testing as described in the Response to Request Item 2(b). The qualified coatings debris quantity associated with a 10D ZOI as discussed in the SER is also quantified in the Debris Generation analysis in the unlikely event that the 5D ZOI assumption cannot be validated. All unqualified coatings within the containment are assumed to fail, either due to jet impingement or subsequent chemical spray.

The characteristics of debris sources are established using NEI 04-07, as modified to address staff comments in the SER.

Debris Transport

The Debris Transport analyses are being performed by Alion Science and Technology (ITS Operation). The analyses are being conducted using the methodology described in NEI 04-07 as modified by NRC staff comments in the SER.

Debris Transport analysis is performed in two steps. First, the debris transport fractions associated with blowdown, washdown and pool fill are established using logic trees as described in NEI 04-07, Section 3.5. The pool recirculation transport analysis utilizes the Computational Fluid Dynamics (CFD-Flow 3D) method as a refinement, as described in NEI 04-07, Section 4.2.4.2. Erosion of larger pieces of debris to fines will be considered as discussed in the SER. The fraction of debris that erodes to fines will be justified in the analysis based on the type of material and its location in the pool.

Consideration of removal of sliding debris by debris interceptors installed around the periphery of the emergency sump will be included if it is determined that source term reduction by this means is required.

Debris Bed Head Loss

The Debris Bed Head Loss evaluation is being performed by Alion Science and Technology (ITS Operation). The evaluation is being conducted using the methodology described in NEI 04-07, Section 3.7, as modified to address staff comments in the SER.

Due to the debris mixture present at BVPS, the high particulate to fiber ratio combined with the presence of calcium silicate would likely result in emergency sump strainer operation in the "thin bed" region. It is planned to use an advanced strainer design with a large surface area, which is expected to load non-uniformly. Due to limitations in the correlation of data from NUREG/CR-6224 to the debris mix present at BVPS, the results of analyses using the NUREG/CR-6224 correlation, while conservative, may not accurately represent the head loss characteristics of such a design. Given current knowledge of the loading characteristics of the type of strainer that will be employed at BVPS, it is expected that, on BVPS-1, debris bed head loss will remain within

the NPSH margin of the ECCS and RSS pumps. On BVPS-2, some actions to reduce the source term for certain types of debris via debris interceptors, insulation modifications and/or insulation removal may be necessary to reduce debris bed head loss. Prototypical testing of the proposed strainer design will be conducted with the BVPS debris characteristics to verify that head loss values will remain within the available NPSH margin of the ECCS and RSS pumps.

The debris bed head loss evaluation will also include a parametric study to determine the debris source reductions that would be required to bring the debris mixture to a point where the NUREG/CR-6224 correlation can be applied. In the event that prototype testing indicates that performance of the proposed strainer approaches that of a flat plate strainer (as tested in NUREG/CR-6224), measures will be taken to reduce the debris source term via debris interceptors, insulation modifications and/or insulation removal to reduce the debris quantities to the levels identified by the parametric study.

Replacement Strainer Design

The replacement strainer is being designed to meet or exceed the 2,500 feet^2 surface area being assumed in the Debris Bed Head Loss evaluation. The design will account for static and dynamic loading under design basis conditions, such as seismic loads and flow induced loads including the loads due to the presence of debris on the strainer surface. The material of construction will be stainless steel so that the post-LOCA chemical environment will have no impact on strainer integrity. The strainer will consist of cylindrical strainer modules, whose surface is maximized by using concentric strainer sections. The delay in the start of recirculation spray and the strainer profile will ensure that the entire assembly will be submerged prior to initiation of recirculation. The strainer media will be perforated plate with holes sized to minimize the impact of debris ingestion on downstream components.

Downstream Effects

Even with the strainer present, small particles will enter the ECCS and RSS fluid streams. A detailed analysis of the downstream components is being performed to assess the impact of debris laden water on those components' post-accident performance. The downstream effects evaluation is being performed by Enercon and Westinghouse. The initial phase of the downstream effects evaluation follows NEI 04-07 methodology. As discussed in FENOC letter L-05-123 of July 22, 2005, additional evaluations to address WCAP-16406-P, "Evaluation of Downstream Sump Debris Effects in Support of GSI-191" are being undertaken at both units. These are anticipated to be completed by the first quarter of 2006.

Chemical Effects

The impact of chemical effects was identified as a potential source of increased head loss during the post-LOCA mission time of the ECCS and RSS. Due to the lack of test information, no specific head loss term has been established for chemical effects. The NRC and industry are currently sponsoring testing to develop the composition of the post-LOCA water chemistry. A test program to assess the impact of this chemistry on debris bed head loss and to develop an applicable correlation is planned for 2006. In the interim, a qualitative assessment of the margin

available to address the potential impact of chemical effects has been included in the Response to Request Item 2(d)(iii).

Programmatic Controls

Once the design basis for the emergency sump strainer has been established, BVPS programs will preserve the design basis, as it relates to the debris quantities and mixture seen at the emergency sump strainer. Programmatic controls established for this purpose are fully described in the Response to Request Item 2(f).

2(d)

The submittal should include, at a minimum, the following information:

2(d)(i)

The minimum available NPSH margin for the ECCS and CSS pumps with an unblocked sump screen.

Response 2(d)(i)

The following results are based upon evaluations done using the containment analysis methodology supporting the license amendment request for containment conversion, presently under NRC review and no strainer head loss. Minimum NPSH margin depends on which option for starting the RSS pumps is selected.

BVPS-1

The limiting minimum available NPSH margin for the ECCS pumps is approximately 5.5 feet. This occurs for the Low Head Safety Injection (LHSI) pumps at the start of cold leg recirculation (cold leg switchover).

The limiting minimum available NPSH margin for the RSS pumps is approximately 4.5 feet. This occurs at the start of recirculation spray for the outside recirculation spray pumps. The inside recirculation spray pump minimum NPSH margin at the start of recirculation spray is approximately 6.3 feet.

The minimum available NPSH occurs for single train operation. These NPSH margins were determined using a recirculation spray starting time delay of 30 minutes and include containment overpressure. The option of starting the RSS pumps based on RWST level results in a small increase in minimum available NPSH margin.

BVPS-2

The limiting minimum available NPSH margin for the RSS pumps is approximately 2.3 feet. This occurs at the start of recirculation spray for the recirculation spray pumps. All of the recirculation spray pumps are located outside of containment. Two of the recirculation spray pumps are also utilized as ECCS (LHSI) pumps.

The minimum available NPSH occurs for single train operation. These NPSH margins were determined using a recirculation spray starting time delay of 30 minutes and include containment overpressure. The option of starting the RSS pumps based on RWST level results in a minimum available NPSH margin of approximately 6.8 feet.

2(d)(ii)

The submerged area of the sump screen at this time and the percent of submergence of the sump screen (i.e. partial or full) at the time of the switchover to sump recirculation.

Response 2(d)(ii)

The approximate total sump strainer surface area for BVPS will be 2,500 feet^2 or more following modifications to install a new passive, complex geometry strainer.

The conceptual design for the new sump strainer shows that the strainer will be 100% (i.e., fully submerged) at the initiation of recirculation for all analyzed breaks. Achieving the necessary water level to ensure the strainer is covered at the start of recirculation is dependent upon the implementation of a delay in the start of the RSS pumps. It is planned to accomplish this either by increasing the setpoint on the existing timer or by starting the pumps based on refueling water storage tank level.

2(d)(iii)

The maximum head loss postulated from debris accumulation on the submerged sump screen, and a description of the primary constituents of the debris bed that result in this head loss. In addition to debris generated by jet forces from the pipe rupture, debris created by the resulting containment environment (thermal and chemical) and CSS washdown should be considered in the analyses. Examples of this type of debris are disbonded coatings in the form of chips and particulates and chemical precipitants by chemical reactions in the pool.

Response 2(d)(iii)

As noted in the Response to Request Item 2(c) above, the NUREG/CR-6224 correlation does not yield meaningful results when the BVPS-1 and BVPS-2 debris loads are applied. The primary constituents of the debris are calcium-silicate insulation, reflective metal insulation, fibrous insulation, and coatings particulates. Due to the high particulate-to-fiber ratio, the correlation predicts strainer operation in the "thin-bed" region with a high solidity fraction for BVPS-1.

BVPS-2 has a higher quantity of fiber, primarily due to the steam generator insulation. BVPS-2 is also predicted to exhibit an equivalent thin-bed effect due to the presence of a larger amount of particulate, primarily calcium silicate.

Prototype testing is planned to quantify and verify the debris bed head loss associated with the new sump strainer. These tests will be performed using flow rates scaled to strainer size and the specific Unit 1 and Unit 2 debris mixture as determined by the results of the debris generation and transport analyses discussed in the Response to Request Item 2(c) above. Based upon previous industry Boiling Water Reactor experience, it is expected that the advanced strainer design will exhibit non-uniform loading and debris bed head losses less than predicted by NUREG/CR-6224.

Should the application of NUREG/CR-6224 be necessary, additional steps to reduce the debris particulate load will be required. A reduction in the amount of calcium-silicate insulation, coatings particulates, and latent particulate would be necessary. With these reductions, the debris bed head loss can be reduced to an acceptable level.

FENOC intends to participate in industry initiatives regarding coatings ZOI testing. It is anticipated that this testing will support a reduction in the necessary ZOI for qualified coatings from 10D to 5D.

With respect to chemical precipitants and long term chemical effects, BVPS-1 and BVPS-2 approximate the conditions tested in Integrated Chemical Effects Test (ICET) #4. It will be confirmed that the ICET test conditions are applicable to BVPS with respect to metals content, pH, etc. Head loss adjustment factors will be included based upon the NEI Sump Performance Task Force guidance.

FENOC intends to participate in chemical effects head loss testing currently being developed through Alion to verify the above adjustments. A schedule for the completion of these tests has not yet been developed. The adjustments ultimately applied will be dependent upon this chemical effects testing.

2(d)(iv)

The basis for concluding that the water inventory required to ensure adequate ECCS or CSS recirculation would not be held up or diverted by debris blockage at choke-points in containment recirculation sump return flowpaths.

Response 2(d)(iv)

The various flow paths for water to reach the emergency sump at BVPS-1 and BVPS-2 were studied to assure that all the water in containment will be available to the post-accident pool. Horizontal platforms have floor grating or openings to allow spray flow to travel to the basement elevation (692'-11"). The refueling canal has a toe plate to prevent spray water that does not directly fall into the refueling canal from entering via the refueling cavity. Water from the refueling cavity returns to the post accident pool via the openings in the seal ring between the refueling cavity floor and the reactor vessel flange. The water then flows from the reactor cavity

to the basement through a 12-inch opening in the cavity wall. (The opening in the wall was installed during 1R16 at BVPS-1 and will be installed during 2R12, in the fall of 2006, at BVPS-2.) At BVPS-1 a weir wall is constructed in the refueling cavity to separate the transfer canal from the remainder of the refueling cavity. At both units, the transfer canal drain valve is normally closed. Therefore, the water that collects in the fuel transfer canal is retained in the canal and does not transport to the sump. However, this volume is already accounted for in the containment water level analysis. No other flow paths were identified that could result in holdup locations that were not already identified in existing analyses. The BVPS containments do not have any significant choke points in the lower elevations, such as doors, that would restrict the flow of water to the containment sump.

2(d)(v)

The basis for concluding that inadequate core or containment cooling would not result due to debris blockage at flow restrictions in the ECCS and CSS flowpaths downstream of the sump screen, (e.g., a HPSI throttle valve, pump bearings and seals, fuel assembly inlet debris screen, or containment spray nozzles). The discussion should consider the adequacy of the sump screen's mesh spacing and state the basis for concluding that adverse gaps or breaches are not present on the screen surface.

Response 2(d)(v)

An evaluation of all downstream systems and recirculation flow paths, and safety related components in those flow paths is being conducted in order to identify the limiting downstream orifice/opening dimensions. The limiting downstream dimension determined in this evaluation or the wear and abrasion effects evaluation (for pump clearances) will be used to determine the maximum opening size for the replacement sump strainers. As noted above, additional evaluations to address WCAP-16406-P are being undertaken at both units. Westinghouse is evaluating the fuel and reactor vessel using the WCAP methodology.

The HPSI throttle valves appear to present the limiting downstream opening size. This evaluation is based upon previous evaluations done in response to NRC Information Notice No. 96-27. Other components were found to have openings that exceeded the current screen opening size. Flow clearances in pumps will be further investigated during the WCAP-16406-P evaluation.

The replacement sump strainer maximum opening size for BVPS will be based upon the limiting downstream opening size, if practical. The replacement sump strainers are planned to have openings smaller than that of the current screen. The replacement sump strainer will be designed such that gaps larger than the hole size are not created. If flow-through of downstream components cannot be guaranteed by the smallest feasible strainer opening size, additional corrective actions will be implemented. Prior to declaring the ECCS and RSS operable following an outage, the sump strainer and containment will continue to be rigorously inspected for damage and cleanliness. Procedural controls will be revised as necessary (based upon the new strainer design and analysis requirements) to ensure cleanliness and integrity of the sump strainer and containment.

2(d)(vi)

Verification that close-tolerance subcomponents in pumps, valves and other ECCS and CSS components are not susceptible to plugging or excessive wear due to extended post-accident operation with debris-laden fluids.

Response 2(d)(vi)

Preliminary downstream effects evaluations of close-tolerance subcomponents utilizing the best available industry information have been performed. The BVPS pumps required during the recirculation phase were evaluated utilizing vendor input. The RSS pump vendor is confident, based on extensive industry experience, that the BVPS-1 and BVPS-2 pumps will not exhibit operability issues due to wear or abrasion for a 30-day mission time. The ECCS and RSS pumps, along with valves and other ECCS and RSS components, will be further evaluated using WCAP-16406-P.

2(d)(vii)

Verification that the strength of the trash racks is adequate to protect the debris screens from missiles and other large debris. The submittal should also provide verification that the trash racks and sump screens are capable of withstanding the loads imposed by expanding jets, missiles, the accumulation of debris, and pressure differentials caused by post-LOCA blockage under predicted flow conditions.

Response 2(d)(vii)

Modifications are planned to replace the sump screens at BVPS-1 and BVPS-2. If needed, debris interceptors and trash racks will be installed as part of this modification. The trash racks and debris interceptors will be designed using applicable BVPS-1 and BVPS-2 seismic criteria, as well as all static and dynamic hydraulic loads. The new strainer and trash rack designs will incorporate the maximum differential pressure loads due to debris accumulation. The new strainer conceptual designs call for the installation of stainless steel deck grating above the strainer, and bars or grating on the sides of the strainer. This will keep large pieces of debris from impacting the strainer media. The sump strainer itself consists of cylindrical modules on the containment floor, connected to a collection header that channels flow to the sump. The cylindrical modules are inherently stronger than equivalent flat plate.

2(d)(viii)

If an active approach (e.g., backflushing, powered screens) is selected in lieu of or in addition to a passive approach to mitigate the effects of the debris blockage, describe the approach and associated analyses.

Response 2(d)(viii)

An active approach solution is not being applied at BVPS. Therefore, this request is not applicable.

2(e)

A general description of and planned schedule for any changes to the plant licensing basis resulting from any analysis or plant modifications made to ensure compliance with the regulatory requirements listed in the Applicable Regulatory Requirements section of this generic letter. Any licensing actions or exemption request needed to support changes to the plant licensing basis should be included.

Response 2(e)

The BVPS containment sump analyses are based upon the analysis and equipment changes undertaken for the containment conversion license amendment requests currently being reviewed by the NRC. The BVPS-1 analysis takes credit for the insulation changes that are included with the replacement steam generators, for which a license amendment request is also being reviewed by the NRC. Additionally, to achieve sufficient water level to cover the containment sump strainers, the start signal for the RSS pumps will be changed following a containment pressurization event. As discussed in the Response to Request Item 2(b), two options are being considered for the change to RSS pump start signal. Option 1 involves extending the current time delay for starting the pumps and Option 2 would replace the time delay with a start signal that is based on refueling water storage tank level. The start signal is currently subject to a timing requirement in the technical specifications. A license amendment request (LAR) to change to the improved standard technical specifications is currently being reviewed by the NRC. This LAR moves the RSS pump start time from the technical specifications to the technical specification bases. This would allow Option 1 to be implemented under 10 CFR 50.59 after the new technical specifications are implemented. The LAR will also credit containment overpressure at BVPS-2 using the same approach that is used at BVPS-1. Implementation of Option 2 would require submittal of a LAR because the timing requirement in the technical specifications would no longer be applicable to the modified starting signal for the RSS pumps. No exemption requests are anticipated. Changes to the licensing basis permitted to be implemented without prior NRC approval would be reflected in the periodic report of facility changes, tests and experiments and/or the UFSAR to the extent required by associated regulations.

2(f)

A description of the existing or planned programmatic controls that will ensure that potential sources of debris introduced into containment (e.g., insulation, signs, coatings, and foreign materials) will be assessed for potential adverse effect on the ECCS and CSS recirculation functions. Addressees may reference their responses to GL 98-04, "Potential for Degradation of the Emergency Core Cooling System and Containment Spray System after a Loss-of-Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment," to the extent that their responses address these specific foreign material control issues.

Response 2(f)

Containment insulation is maintained in accordance with the plant standards PIPS M10.1 and PIPS M10.2, Thermal and Sound Insulation for BVPS Unit 1/2. These standards are based upon the original insulation specifications used at the power plants. Changes to the plant are processed under NOP-CC-2003, Engineering Changes. This requires a review for possible impacts that includes a requirement to consider any changes to insulation.

Plant labels and signs are now controlled by procedure 1/2-ADM-0700, Guidelines for Plant Labeling and Tagging, implemented in 2004. This implements special requirements on labels, signs, and placards inside containment to assure that they are able to meet the post-LOCA environment.

The containment coatings are maintained as described in the BVPS response to Generic Letter 98-04 (ref. letter L-98-217, dated November 11, 1998).

To assure that the BVPS containment buildings are kept in a clean condition with a minimum of extraneous items, the Containment Closeout Inspection (1OST-47.2B and 2OST-47.2B) is done at the conclusion of each refueling outage. This inspection assures that the containment is left in a clean state.

ATTACHMENT 2 to L-05-146

Commitment List

The following list identifies those actions committed to by FirstEnergy Nuclear Operating Company (FENOC) for Beaver Valley Power Station (BVPS) Unit Nos. 1 and 2 in this document. Any other actions discussed in the submittal represent intended or planned actions by FENOC. They are described only as information and are not regulatory commitments. Please notify Mr. Henry L. Hegrat, Supervisor - Licensing at 330-315-6944 of any questions regarding this document or associated regulatory commitments.

Commitment	Due Date
Complete prototype testing of proposed strainer design.	March 2006
Assess impact of industry coatings zone of influence testing on prior analysis results	June 2006 (assuming March 2006 availability of industry test results)
Conduct a follow-up walkdown of the BVPS-1 containment to validate the assumed debris quantity and reevaluate the latent debris quantity based upon the results of the walkdown.	August 2006
Implement modifications that replace emergency sump screens at BVPS-2.	Fall 2006 Refueling Outage (2R12)
Implement modifications that replace emergency sump screens and change start signal for recirculation spray pumps at BVPS-1.	Fall 2007 Refueling Outage (1R18)
Implement modifications to recirculation spray pump start signal at BVPS-2.	Spring 2008 Refueling Outage (2R13)