



FirstEnergy Nuclear Operating Company

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December 7, 2007
L-07-142

ATTN: Document Control Desk
U. S. Nuclear Regulatory Commission
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
Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency
Recirculation During Design Basis Accidents at Pressurized-Water Reactors" - Request
for Extension of Completion Date for Corrective Actions

NRC Generic Letter (GL) 2004-02 (Reference 1) requested that licensees provide information regarding the potential impact of debris blockage on emergency recirculation during design basis accidents. FirstEnergy Nuclear Operating Company (FENOC) provided the requested information for Beaver Valley Power Station (BVPS), Unit Nos. 1 and 2 in References 3, 4 and 5. In subsequent letters dated April 3, 2006 (Reference 2) and September 6, 2005 (Reference 6), FENOC requested an extension for BVPS Unit No. 2 to permit the completion of the installation of the Recirculation Spray System (RSS) pumps start signal and the High Pressure Safety Injection Throttle Valve gap sizing modifications during the spring 2008 refueling outage (2R13). The NRC approved the BVPS Unit No. 2 extension request in their letter dated May 18, 2006 (Reference 7).

GL 2004-02 also requested that all licensees complete actions related to the Generic Letter by December 31, 2007, or provide justification for continued operation until the actions are completed. This letter requests an extension for the completion date of certain GL 2004-02 activities beyond December 31, 2007.

Replacement strainers have been installed at BVPS Unit No. 1 and Unit No. 2; during the BVPS Unit No. 2 fall 2006 refueling outage (2R12) and during the BVPS Unit No. 1 fall 2007 refueling outage (1R18). The new replacement strainers provide design improvements including increased surface area and filtering capability.

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In addition to the replacement strainers, a modification to the start signal for the RSS pumps was completed at BVPS Unit No. 1 during 1R18. This modification will allow sufficient pool depth to cover the sump strainers before initiating recirculation flow in the event of a loss of coolant accident (LOCA). At BVPS Unit No. 2, this modification is scheduled to be completed during the spring 2008 refueling outage (2R13).

A downstream effects analysis was conducted for both BVPS Unit Nos. 1 and 2 in accordance with WCAP-16406-P Revision 0 "Evaluation of Downstream Debris Effects in Support of GSI-191". As a result, the High Pressure Safety Injection Cold Leg Throttle Valves were replaced during 1R18 at BVPS Unit No. 1. At BVPS Unit No. 2, the High Pressure Safety Injection Throttle Valves will be modified during the spring 2008 Refueling Outage (2R13). The recently issued guidance on downstream effects, both in-vessel and ex-vessel, will require the previously developed analyses to be revised. FENOC will complete further evaluations to fully address downstream effects (both in-vessel and ex-vessel) by June 30, 2008.

In Response 2(d)(iii) of Reference 6, FENOC stated that chemical effects testing was being developed, and that additional steps to reduce the debris particulate load inside the BVPS Unit No. 1 and Unit No. 2 Containment Buildings would be dependent on the results of the testing. The chemical effects testing was conducted in November 2007, however, the evaluation of the results will not be completed by the end of 2007. Based upon the preliminary chemical effects test data, the results indicate that additional modifications will be required to fully resolve the issue. FENOC will fully assess the chemical effects testing that has been performed to date, formalize the results, and develop required corrective actions by June 30, 2008.

Therefore, FENOC is requesting a schedule extension to June 30, 2008 for BVPS-1 and BVPS-2 to complete the remaining technical evaluations as well as to develop the additional corrective actions that will be required based on the results of these evaluations. This extension request is being submitted using the criteria of SECY-06-0078 and the guidance provided in NRC letter dated November 8, 2007 (Reference 8).

Attachment 1 provides the basis supporting FENOC's conclusion that it is acceptable to extend the completion dates for these corrective actions beyond the December 31, 2007 deadline for BVPS Unit Nos. 1 and 2. Mitigative measures to minimize the risk of degraded safety system functions are included in the attached supporting basis.

A list of regulatory commitments made in this submittal is provided in Attachment 2. If there are any questions, or if additional information is required, please contact Mr. Thomas A. Lentz, Manager – FENOC Fleet Licensing, at 330-761-6071.

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 7, 2007.

Sincerely,



Peter P. Sena III

Attachments:

1. Justification for Additional Corrective Actions Extending Beyond December 31, 2007
2. List of Commitments

References:

1. Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated September 13, 2004.
2. FENOC Letter L-06-020 Supplemental Response to Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated April 3, 2006.
3. FENOC Letter L-06-171 "Revised Commitment Date Relevant to FirstEnergy Nuclear Operating Company Correspondence to the NRC, Dated September 29, 2006," dated December 21, 2006.
4. FENOC Letter L-05-123 Response to Request for Additional Information on Generic Letter 2004-02 (TAC Nos. MC4665 and MC4666), dated July 22, 2005.
5. FENOC Letter L-05-034 Response to Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated March 4, 2005.
6. FENOC Letter L-05-146 Response to Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated September 6, 2005.

7. NRC letter dated May 18, 2006 Beaver Valley Power Station, Unit No. 2 (BVPS-2) - Request for Scheduling Extension from Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors."
 8. NRC letter to NEI dated November 8, 2007 "Plant-Specific Requests for Extension of Time to Complete One or More Corrective Actions for Generic Letter 2004-02 Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors."
- c: Mr. S. J. Collins, NRC Region I Administrator
Mr. D. L. Werkheiser, NRC Senior Resident Inspector
Ms. N. S. Morgan, NRR Project Manager
Mr. D. J. Allard, Director BRP/DEP
Mr. L. E. Ryan (BRP/DEP)

ATTACHMENT 1
L-07-142

Justification for Additional Corrective Actions Extending Beyond December 31, 2007
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Background:

Generic Letter (GL) 2004-02 (Reference 1) required that addressees provide a description of and implementation schedule for all corrective actions, including any plant modifications, that are identified while responding to the GL. FirstEnergy Nuclear Operating Company (FENOC) provided the requested information for Beaver Valley Power Station (BVPS) 1 and 2 in References 3, 4 and 5. In subsequent letters dated April 3, 2006 (Reference 2) and September 6, 2005 (Reference 6), FENOC requested an extension for BVPS-2 to permit the completion of the installation of the Recirculation Spray System (RSS) pumps start signal and the High Pressure Safety Injection Throttle Valve gap sizing modifications during the spring 2008 refueling outage (2R13). The NRC approved the BVPS-2 extension request in their letter dated May 18, 2006 (Reference 7).

During the ensuing work to complete the GL 2004-02 corrective actions, it has become apparent that certain activities required to resolve the containment sump issues cannot be completed within the current schedules, and, therefore, extensions to complete the corrective actions are necessary. Certain activities have been identified for BVPS-1 and BVPS-2 that will not be completed by December 31, 2007; specifically, the downstream effects evaluations for components (in-vessel and ex-vessel), the chemical effects testing and evaluation, and the associated acceptance reviews. Based upon the preliminary chemical effects test data, the results indicate that additional modifications will be required to fully resolve the issue. The extension is required to fully assess the chemical effects testing that has been performed to date, formalize the results, and develop required corrective actions.

Therefore, FENOC is requesting a schedule extension for BVPS-1 and BVPS-2 to complete the remaining technical evaluations as well as to determine what additional actions will be required based on the results of these evaluations. Justification is provided herein for an extension to the schedule beyond the December 31, 2007 implementation date for completion of actions at BVPS-1 and BVPS-2 associated with chemical effects and downstream effects (in-vessel and ex-vessel). This extension request is being submitted using the criteria of SECY-06-0078 (Reference 9) and the guidance provided in the NRC letter to NEI dated November 8, 2007 (Reference 10). Mitigative measures to minimize the risk of degraded safety system functions are included in the supporting basis provided below.

Activities Already Completed or to be Completed by December 31, 2007:

- Strainer replacements have been installed at both units. At BVPS-2, the new replacement strainer was installed during the fall 2006 refueling outage (2R12) which increased the available surface area from approximately 150 sq. ft. to 3300 sq. ft. At BVPS-1, the new replacement strainer was installed during the fall

2007 refueling outage (1R18) which increased the available surface area from approximately 130 sq. ft. to 3400 sq. ft.

- Replacement of BVPS-1 High Pressure Safety Injection Cold Leg Throttle Valves to increase the throttle valve gap.
- Changing the BVPS-1 start signal for the RSS pumps from a fixed time delay to an Engineered Safety Features Actuation System (ESFAS) signal based on a Refueling Water Storage Tank (RWST) Level Low coincident with a Containment Pressure High-High signal to allow sufficient pool depth to cover the sump strainer before initiating recirculation flow.
- Replacement of the BVPS-1 Reactor Vessel Closure Head insulation from Borated Temp Mat insulation encapsulated in Reflective Metal Insulation (RMI) to RMI during the spring 2006 refueling outage (1R17) to reduce particulate loading on the sump strainer.
- New RMI was installed on the BVPS-1 Replacement Steam Generators (RSGs) and associated piping in the vicinity of the RSGs during the spring 2006 refueling outage (1R17).
- Prototype testing of new strainer design was completed for BVPS-1 and BVPS-2.

Activities to be Completed During the BVPS-2 Spring 2008 Refueling Outage (2R13)

- Modification of the BVPS-2 High Pressure Safety Injection Throttle Valves to increase the throttle valve gap.
- Changing the BVPS-2 start signal for the RSS pumps from a fixed time delay to an ESFAS signal based on a RWST Level Low coincident with a Containment Pressure High-High signal to allow sufficient pool depth to cover the sump strainer before initiating recirculation flow.
- Replacement of the BVPS-2 Reactor Vessel Closure Head flange insulation from Borated Temp Mat insulation encapsulated in RMI to RMI, and selected portions of Reactor Coolant System and Safety Injection System piping insulation from Min-K insulation encapsulated in RMI to Thermal Wrap insulation encapsulated in RMI.
- A containment coatings inspection and evaluation program will be implemented starting with the BVPS-2 Spring 2008 refueling outage. Containment coatings inspections will be a scheduled activity for the refueling outages at both BVPS-1 and BVPS-2.

Justification for Proposed Extension:

The NRC staff provided a justification for continued operation (JCO) in GL 2004-02 that justifies continued operation of pressurized water reactors through December 31, 2007. Elements of the JCO that are applicable to BVPS-1 and BVPS-2 are summarized below:

- The BVPS containments are compartmentalized making transport of debris to the sump difficult.
- BVPS does not require switchover to recirculation from the sump during a large-break loss-of-coolant accident (LOCA) until 20 to 30 minutes after accident initiation, allowing time for much of the debris to settle in other places within containment.
- The probability of the initiating event (i.e., large and intermediate-break LOCAs) is extremely low.
- Leak-before-break (LBB) qualified piping is of sufficient toughness that it will most likely leak (even under safe shutdown earthquake conditions) rather than rupture.
- The current industry issue regarding primary water stress corrosion cracking (PWSCC) associated with pressurizer Alloy 600/82/182 dissimilar metal welds at both BVPS-1 and BVPS-2 has been addressed. Full structural weld overlays on the BVPS-2 pressurizer spray, safety, relief and surge line nozzles were completed during the fall 2006 refueling outage (2R12). Similarly, full structural weld overlays were applied to the BVPS-1 pressurizer spray, safety, and relief nozzles during the fall 2007 refueling outage (1R18).
- The impact on risk for the 6 month extension period for actions to address chemical and downstream effects beyond the December 31, 2007 implementation date specified in GL 2004-02 is low based on the mitigative measures identified in this supporting document.

These elements will remain valid during the extension period requested by this submittal.

Compliance with SECY-06-0078 Criteria

SECY-06-0078 specifies two criteria for short duration GL 2004-02 extensions, limited to several months, and a third criterion for extensions beyond several months. These three criteria and FENOC's responses are provided below.

SECY-06-0078 Criterion No. 1:

The licensee has a plant-specific technical/experimental plan with milestones and schedule to address outstanding technical issues with enough margin to account for uncertainties.

FENOC Response:

BVPS has replaced the sump strainers for both units as follows:

- BVPS-2: Replaced during the 2R12 Refueling Outage (Fall 2006)
- BVPS-1: Replaced during the 1R18 Refueling Outage (Fall 2007)

The new strainers are a significant improvement over the original screen design. The new BVPS-1 strainer increases the surface area from 130 ft² to 3400 ft². The new BVPS-2 strainer increases the surface area from 150 ft² to 3300 ft².

In addition to the replacement of the strainers, a modification was completed for BVPS-1 during the fall 2007 refueling outage (1R18) that would allow sufficient pool depth to cover the sump strainers before initiating recirculation flow. The modification changed the BVPS-1 start signal for the RSS pumps from a fixed time delay to an ESFAS signal based on a RWST Level Low coincident with a Containment Pressure High-High signal. For BVPS-1, an operating strategy that directs securing of two of four RSS pumps upon transfer to cold leg recirculation has been implemented. This will reduce the velocity through the emergency sump strainer. At BVPS-2, the modification is scheduled to be completed during the spring 2008 refueling outage (2R13). The schedule extension for implementation of this modification beyond December 31, 2007 at BVPS-2 was approved by the staff via letter dated May 18, 2006 (Reference 7).

Mitigation efforts at BVPS-1 and BVPS-2 have been completed for addressing the issue associated with PWSCC and the pressurizer alloy 600/82/182 dissimilar metal welds. PWSCC was addressed during the BVPS-2 Fall 2006 refueling outage (2R12) through the application of full structural weld overlays on the pressurizer spray, safety, relief and surge line nozzles. Similarly, full structural weld overlays were applied to the BVPS-1 pressurizer spray, safety, and relief nozzles during the BVPS-1 fall 2007 refueling outage (1R18),

CHEMICAL EFFECTS (WCAP-16530-NP)

Chemical effects testing for both BVPS-1 and BVPS-2 was completed by Alion in November 2007; however, the final test reports for both units will not be completed by December 31, 2007. The results of these tests need to be evaluated for total head loss due to chemical effects.

The evaluations for chemical effects analysis will be completed and a supplemental response will be provided to the NRC by June 30, 2008.

DOWNSTREAM EFFECTS EX-VESSEL (WCAP-16406-P)

BVPS-1 and BVPS-2 have been evaluated for ex-vessel downstream analysis based on the criteria established in WCAP-16406-P Rev 0. Based on this evaluation the High Pressure Safety Injection Cold Leg Throttle valves were replaced during 1R18 at BVPS-1. At BVPS-2, the High Pressure Safety Injection Throttle Valves are scheduled to be modified during the 2R13 outage in spring 2008. The schedule extension for implementation of this modification beyond December 31, 2007 at BVPS-2 was approved by the staff via letter dated May 18, 2006 (Reference 7).

Preliminary evaluations have been performed for orifices and pumps under the WCAP-16406-P Rev 1 methodology, however the final evaluations will not be completed by December 31, 2007. The ex-vessel downstream effects analyses for BVPS-1 and BVPS-2 will be completed and a supplemental response will be provided by June 30, 2008.

DOWNSTREAM EFFECTS IN-VESSEL (WCAP-16793)

The final site specific analyses are to be developed by our NSSS Vendor, but will not be completed by December 31, 2007. The in-vessel downstream effects analyses for BVPS-1 and BVPS-2 will be completed and a supplemental response will be provided by June 30, 2008.

SECY-06-0078 Criterion No. 2:

The licensee identifies mitigative measures to be put in place prior to December 31, 2007, and adequately describes how these mitigative measures will minimize the risk of degraded ECCS [emergency core cooling system] and CSS [containment spray system] functions during the extension period.

Response:

The following mitigative measures have been implemented to minimize the risk of degraded ECCS and CSS functions during the extension period.

Mitigative Measures:

Modifications to the Sump Screen Configuration at BVPS-1 and BVPS-2

During the BVPS-1 fall 2007 refueling outage (1R18), BVPS-1 installed new sump strainers that increased the available surface area from approximately 130 sq. ft. to 3400 sq. ft., to improve existing margins.

During the BVPS-2 fall 2006 refueling outage (2R12), BVPS-2 installed new sump strainers that increased the available surface area from approximately 150 sq. ft. to 3300 sq. ft., to improve existing margins.

For both units, the new strainer design was chosen based on the largest available sump strainer that would fit within the bounds of the existing sump area and be compatible with the anticipated water level. The new sump strainer is designed to reduce both head loss and the ingestion of debris, which could affect safety-related downstream components. The strainers are sized to preclude the passage of debris large enough to cause loss-of-function of downstream components.

Containment Spray System Design

As noted above, a modification to the containment sump was identified in the FENOC supplemental response to Generic Letter 2004-02 in FENOC letter L-06-020 dated April 3, 2006. Since the adoption of a licensing basis consistent with Generic Letter 2004-02 will result in an increase in the containment sump strainer head loss, it is necessary to increase the static height of water in the containment sump at both units in order to increase NPSH margin available. This is accomplished by changing the start signal for the RSS pumps from a fixed time delay to an ESFAS signal based on a RWST Level Low coincident with a Containment Pressure High-High signal. Starting the RSS pumps on this coincident signal provides assurance of adequate sump water level at RSS pump start over the range of potential break sizes and single failure assumptions. The higher water level will also ensure that the new containment sump strainers will be submerged while accommodating a substantial increase in available surface area.

BVPS-1 completed the modifications associated with the RSS pump start signal during the 2007 fall refueling outage (1R18). For BVPS-2, a schedule extension for completion of the change associated with the RSS pump start signal during the spring 2008 refueling outage (2R13) was granted by NRC via letter dated May 18, 2006.

Insulation Remediation

BVPS-1:

New RMI was installed on the BVPS-1 RSGs and associated piping in the vicinity of the RSGs during the spring 2006 refueling outage (1R17). The associated piping includes the Reactor Coolant System crossover leg elbow, the main steam piping between the RSG main steam nozzle and first pipe rupture restraint, feedwater piping between the RSG feedwater nozzle and the first pipe rupture restraint, and the existing blowdown and shell drain piping between the RSG nozzles to the point where the two blowdown lines and the shell drain merge into a common header.

New RMI was also installed on the new BVPS-1 Reactor Vessel Closure Head (RVCH) during the spring 2006 refueling outage (1R17) to reduce debris loading on the sump strainer.

BVPS-2:

Additional insulation replacement in the BVPS-2 containment is scheduled for 2R13 in spring 2008. Based on debris head loss testing, plans are in-place to replace problematic insulation in terms of head loss during the spring 2008 outage at BVPS-2. The replacement will include the RVCH flange insulation at BVPS-2 from Borated Temp Mat insulation encapsulated in RMI to RMI.. Selected portions of Reactor Coolant and Safety Injection piping located inside the steam generator cubicles presently use Min-K insulation encapsulated in RMI. This insulation is also scheduled to be replaced with Thermal Wrap insulation encapsulated in RMI during 2R13.

Debris Generation

The debris generation and transport analyses have been performed by Alion Science and Technology. The analyses were 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. BVPS-1 analysis has been completed and was used as input for the design of the new containment sump strainers. BVPS-2 analysis is in the process of being revised to account for the insulation changes to be implemented during the spring 2008 refueling outage (2R13).

Periodic containment walkdowns are conducted using procedures which focus on sources, types and locations of items or conditions having the potential to become debris following a LOCA. Noted discrepancies are addressed via the BVPS corrective action program.

Leak-Before-Break

Postulated breaks in the reactor coolant loop and the pressurizer surge line have been evaluated for both BVPS-1 and BVPS-2 by application of leak-before-break (LBB) technology.

While LBB is not being used to establish the design basis debris load on the new sump strainers, the use of LBB would result in a substantial reduction in the zone of influence, and thus a significant reduction in the postulated debris generation, loading on the sump strainers, and potential clogging and wear of downstream components. With the installation of the additional sump strainer area, the possibility of clogging due to debris is greatly reduced.

Implementation of Mitigative Measures in Response to Bulletin 2003-01

In addition to the plant modifications and mitigative measures described above, current mitigative measures in response to Bulletin 2003-01 "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors" (Reference 11) are in place and continue to be current. FENOC's response is documented in Reference 12 for BVPS-1 and BVPS-2. By letter dated September 6, 2005 (Reference 13), the NRC staff concluded that the compensatory measures that have been implemented to reduce the interim risk associated with the potentially degraded or nonconforming emergency core cooling system and containment spray system recirculation function are responsive to and meet the intent of Bulletin 2003-01.

In summary, these mitigative measures include:

1. Provisions of procedural guidance and operator training on indications of and responses to sump clogging. The guidelines contain instructions to establish flow to the reactor if symptoms of containment sump blockage are present.
2. Procedural guidance to minimize RWST inventory depletion in the event of loss of sump recirculation capability. Procedural guidance is also provided to refill the RWST when SI recirculation flow is reduced or lost when symptoms of containment sump blockage are present.
3. Procedural guidance to refill the RWST through the normal makeup path and other alternate sources in the event containment sump blockage is a concern.
4. Implementation of mitigative measures that assure containment cleanliness and foreign material exclusion:
 - a) Foreign material exclusion (FME) is assured by procedural controls at BVPS-1 and BVPS-2, which applies to inspection, operation, maintenance and outage activities.
 - b) Ensuring sump strainers are free of adverse gaps and breaches, and verifying each refueling outage that the sumps are free of debris in accordance with surveillance requirements of the Technical Specifications at each unit.
 - c) Procedures require the use of the recirculation spray pumps at BVPS-1 and BVPS-2 to circulate water through the sump after installing a temporary dike around the sump. Although this test is intended to confirm pump performance, it also provides confidence of sump function, and is performed each refueling outage.

- d) Other procedures which focus on sources, types and locations of items or conditions having potential to become debris following a LOCA are also utilized. These procedures specifically identify examples of items to look for that may have the potential to be transported to the containment sump under accident conditions. Noted discrepancies are addressed via the BVPS corrective action program.
- e) Plant labels and signs are controlled by procedure that implements special requirements on labels, signs, and placards inside containment at BVPS-1 and BVPS-2 to assure that they meet the post-LOCA environment requirements.

These mitigative measures are already in place to minimize the risk of degraded ECCS and CSS functions during the requested extension period.

In addition, a containment coatings inspection and evaluation program is scheduled to be implemented starting with the BVPS-2 Spring 2008 refueling outage. Containment coatings inspections will be a scheduled activity for the refueling outages at both BVPS-1 and BVPS-2. This commitment is identified in Attachment 2 of this correspondence.

SECY-06-0078 Criterion No. 3:

For proposed extensions beyond several months, a licensee's request will more likely be accepted if the proposed mitigative measures include temporary physical improvements to the ECCS sump or materials inside containment to better ensure a high level of ECCS sump performance.

FENOC Response:

Physical mitigative measures in place at BVPS-1 and BVPS-2 are described in detail in Section SECY-06-0078 Criterion 2 of this extension request. A risk assessment has been performed for both BVPS-1 and BVPS-2 to assess the risk for the 6 month extension period.

Risk Assessment:

Chemical Effects

The initial chemical effects testing has been completed for both BVPS-1 and BVPS-2; however, the final report and evaluations will not be completed by December 31, 2007.

A probabilistic risk assessment (PRA) has been performed for both BVPS-1 and BVPS-2 to assess the risk for the 6 month extension period. The PRA reviewed the plant-specific debris generation/transport evaluations for BVPS-1 and BVPS-2 to identify break sizes and locations where satisfactory performance of the sump strainers

was demonstrated due to the limited debris mass generated. The conclusion of this review determined that line breaks less than 6 inches will not generate significant quantities of fibrous material and cannot create a closed layer of debris coverage over the new containment sump strainers.

The PRA also reviewed preliminary chemical test reports on chemical precipitate generation rates, which indicate that it would take more than 24-hours to result in any significant head loss due to the chemical products reacting with the sump strainer debris. Therefore, given this time margin and multiple cold or hot leg safety injection flow paths available, credit was also taken for plant operators to use existing emergency operating procedures for makeup to the RWST and to realign the safety injection system to take suction from the RWST following blockage of the containment sump due to chemical effects.

The risk assessment estimated that the increase in core damage frequency (CDF) is less than $1.0E-06$ per reactor year and there would not be a significant increase in the large early release frequency (LERF) risk above the RG 1.174 acceptance limit of $1.0E-07$ per year. The calculated increases of CDF and LERF are very small, as defined by the RG 1.174 acceptance limits based on the 6 month extension request.

Downstream Effects Ex-Vessel

Downstream effects evaluations have been performed for BVPS-1 and BVPS-2 to the requirements of Revision 0 of WCAP-16406-P. The High Pressure Safety Injection Cold Leg Throttle valves have been replaced at BVPS-1 and are scheduled to be modified at BVPS-2 during 2R13 in the spring of 2008 as a result of the evaluations.

Based on the margins for plugging and wear, the completion of this evaluation to Revision 1 of the WCAP is not expected to result in a change of conclusions. Preliminary evaluations for plugging and wear using the criteria in WCAP-16406-P Revision 1 have been performed which substantiate this assessment. All components with the exception of the High Pressure Safety Injection Throttle valves and the High Head Safety Injection (HHSI) pumps are found acceptable when evaluated under the WCAP methodology. Preliminary evaluations indicate that the HHSI pumps at BVPS-1 and BVPS-2 will maintain adequate hydraulic performance for their 30 day mission time. The potential for mechanical seal failure due to debris blocking axial movement of the rotating seal face, or due to debris blocking the seal injection flow line, is considered low. There is little potential for significant debris-induced wear of the seal faces due to the tight running gap, which matches the conclusion given in WCAP-16406-P regarding the potential for seal face degradation.

Detailed evaluations are continuing, however based on the preliminary results it is expected that the HHSI pumps will yield acceptable results and the increase in risk for the duration of the requested extension is negligible.

Downstream Effects In-Vessel

The BVPS-1 and BVPS-2 site specific in-vessel downstream analysis has not been finalized, however based on evaluations performed to date, the increase in risk is low for the duration of the extension period requested.

Westinghouse has developed preliminary evaluations for both BVPS-1 and BVPS-2 for in-vessel downstream effects. These evaluations have identified flow paths and have evaluated the potential for blockage of these flow paths by both particulate and fibrous debris. The review concluded that based on the containment sump strainer sizes at both BVPS-1 and BVPS-2, that the points of interest are sufficiently large to preclude plugging during hot leg or cold leg recirculation.

Strainer debris bypass test results for BVPS-1 and BVPS-2 have been reviewed by Westinghouse and preliminary conclusions indicate that the predicted in-vessel debris will not result in a thin bed effect.

WCAP-16793 in section 5.7 shows the results of the core chemistry effects analysis done with input conditions simulating a 3188 MW thermal PWR with both a high fiberglass debris loading (7000 ft³) and a large quantity of calcium silicate debris (80 ft³). Sodium hydroxide was present for pH control and there were 15,189 square feet of un-submerged aluminum and 799 sq. ft. of submerged aluminum. The long term core cooling was shown not to be compromised.

A comparison of the debris inputs used in the WCAP analysis with the corresponding debris at BVPS-1 and BVPS-2 shows that the WCAP analysis bounds the quantity of debris predicted at both BVPS-1 and BVPS-2:

With the exception of un-submerged aluminum, the BVPS-1 and BVPS-2 values are much smaller than those used in the demonstration case.

The evaluations performed provide assurance of long-term core cooling for both BVPS-1 and BVPS-2. Specifically:

- Adequate flow to remove decay heat will continue to reach the core even with debris from the sump reaching the RCS and core.
- Decay heat will continue to be removed even with debris collection at the fuel assembly spacer grids.
- Fibrous debris, should it enter the core region, will not tightly adhere to the surface of fuel cladding.
- Using an extension of the chemical effects method developed in WCAP-16530-NP to predict chemical deposition of fuel cladding, two sample calculations using large debris loadings of fiberglass and calcium silicate, respectively, were

performed per the WCAP. The cases demonstrated that decay heat would be removed and acceptable fuel clad temperatures would be maintained.

As blockage of the core will not occur, the mixing volumes assumed for the current licensing basis boric acid dilution evaluations are not affected by debris and chemical products transported into the RCS and the core by recirculating fluid from the containment sump. Therefore, the current analysis that demonstrates appropriate boric acid dilution to preclude boric acid precipitation remains valid.

Given the above, it is therefore concluded that BVPS-1 and BVPS-2 will maintain adequate long-term core cooling with consideration for debris and chemical products in the recirculating fluid.

To confirm that the WCAP results bound the BVPS case, BVPS-1 and BVPS-2 will be analyzed using the WCAP site specific methodology. However, based on the evaluations performed to date, the increase in risk for the duration of our requested extension period is negligible.

Based on the discussions presented within this correspondence, FENOC has determined that overall plant safety will be maintained throughout the requested extension period for BVPS-1 and BVPS-2.

List of References

1. NRC Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated September 13, 2004.
2. FENOC Letter L-06-020 Supplemental Response to Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated April 3, 2006.
3. FENOC Letter L-06-171 "Revised Commitment Date Relevant to FirstEnergy Nuclear Operating Company Correspondence to the NRC, Dated September 29, 2006," dated December 21, 2006.
4. FENOC Letter L-05-123 Response to Request for Additional Information on Generic Letter 2004-02 (TAC Nos. MC4665 and MC4666), dated July 22, 2005.
5. FENOC Letter L-05-034 Response to Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated March 4, 2005.
6. FENOC Letter L-05-146 Response to Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors," dated September 6, 2005.
7. NRC letter dated May 18, 2007 Beaver Valley Power Station, Unit No. 2 (BVPS-2) - Request for Scheduling Extension from Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors."
8. Summary of July 26-27, 2001, Meeting with Nuclear Energy Institute and Industry on ECCS Strainer Blockage in PWRs, dated August 14, 2001.
9. SECY-06-0078, from L. A. Reyes, NRC Executive Director for Operations, to NRC Commissioners, "Status of Resolution of GSI -191, 'Assessment of [Effect of] Debris Accumulation on PWR [Pressurized Water Reactor] Sump Performance,'" dated March 31, 2006.
10. NRC letter to NEI dated November 8, 2007 "Plant-Specific Requests for Extension of Time to Complete One or More Corrective Actions for Generic Letter 2004-02 Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors."
11. NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," dated June 9, 2003.

12. FENOC Letter L-03-117, "60-Day Response to NRC Bulletin 2003-01," dated August 8, 2003.
13. NRC letter dated September 6, 2005 "Beaver Valley Power station, Unit Nos. 1 and 2 Response to NRC Bulletin 2003-01, Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized Water Reactors (TAC NOS. MB9554 and MB9555).

ATTACHMENT 2
L-07-142

Regulatory Commitment List
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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. Thomas A. Lentz, Manager - Licensing, at (330) 761-6071 of any questions regarding this document or associated Regulatory Commitments.

<u>Regulatory Commitments</u>	<u>Due Date</u>
1. FENOC will complete further evaluations to fully address downstream effects (both in-vessel and ex-vessel) by June 30, 2008.	6/30/2008
2. FENOC will fully assess the chemical effects testing that has been performed to date, formalize the results, and develop required corrective actions by June 30, 2008.	6/30/2008
3. A containment coatings inspection and evaluation program will be implemented starting with the BVPS-2 Spring 2008 refueling outage. Containment coatings inspections will be a scheduled activity for the refueling outages at both BVPS-1 and BVPS-2.	BVPS-2 Spring 2008 Refueling Outage (2R13)