

**Peter P. Sena III**  
Site Vice President

724-682-5234  
Fax: 724-643-8069

August 28, 2008  
L-08-257

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 (TAC Nos. MC4665 and  
MC4666)

By letter dated February 14, 2008 (Reference 1), FirstEnergy Nuclear Operating Company (FENOC) provided an extension request for completion of certain corrective actions related to Generic Letter (GL) 2004-02 (Reference 2) for Beaver Valley Power Station Unit No. 1 (BVPS-1) and Unit No. 2 (BVPS-2). The NRC evaluated and approved the extension for completion of the corrective actions to September 30, 2008 for BVPS-1 and March 31, 2009 for BVPS-2 in a letter dated February 29, 2008 (Reference 3).

FENOC hereby requests an additional extension to complete GL 2004-02 corrective actions prior to startup following the BVPS-1 refueling outage scheduled to begin in April of 2009 and prior to startup following the BVPS-2 refueling outage scheduled to begin in October of 2009. This extension request is being submitted using the criteria of SECY-06-0078 and the guidance provided in an NRC letter to NEI dated November 8, 2007 (Reference 4).

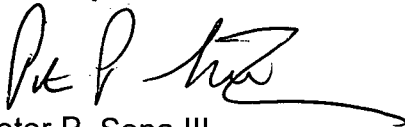
Attachment 1 provides the basis supporting FENOC's conclusion that it is acceptable to extend the completion dates for these corrective actions beyond the current schedule (September 30, 2008 for BVPS-1 and March 31, 2009 for BVPS-2). A risk assessment has been developed and mitigative measures to minimize the risk of degraded safety system functions are included in the attached supporting basis.

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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 August 28, 2008.

Sincerely,



Peter P. Sena III

Attachments:

1. Justification for Additional Corrective Actions Extending Beyond September 30, 2008 for Beaver Valley Power Station Unit No. 1 (BVPS-1) and March 31, 2009 for Unit No. 2 (BVPS-2)
2. List of Commitments

References:

1. FENOC Letter L-08-054, 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, dated February 14, 2008
2. 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.
3. NRC letter, Beaver Valley Power Station, Units 1 and 2 Extension Request Approval Letter Re. Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation during Design Basis Accidents at Pressurized-Water Reactors" (TAC Nos. MC4665 and MC4666), dated February 29, 2008.
4. Mr. W. H. Ruland, NRC Division of Safety Systems Director, letter to Mr. A. R. Pietrangelo of the Nuclear Energy Institute, Subject: 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," dated November 8, 2007.

- 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-08-257

Justification for Additional Corrective Actions Extending Beyond  
September 30, 2008 for Beaver Valley Power Station Unit No. 1 (BVPS-1)  
and March 31, 2009 for Unit No. 2 (BVPS-2)  
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## **I. CORRECTIVE ACTION EXTENSION**

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 BVPS-1 and BVPS-2 in References 2, 3, 4, 5 and 6.

### **BVPS-1 BACKGROUND AND PLANNED ACTIONS**

In response to GL 2004-02, initial chemical effects testing for BVPS-1 was performed with debris load and chemical precipitants. This initial testing was determined to be inconclusive. By letter dated February 14, 2008 (Reference 7), FENOC requested an extension to the spring 2009 refueling outage (1R19) to complete additional testing and to complete mitigative actions which may result from the testing. Since the results of the testing were not yet available at the time of the submittal of the February 14, 2008 extension request, subsequent discussions with the Nuclear Regulatory Commission staff (NRC) resulted in an approved extension to September 30, 2008 (see Reference 8).

The additional testing has been performed using both the "Evaluation of Post-Accident Chemical Effects in Containment Sump Fluids to Support GSI-191" (WCAP 16530-NP, Reference 9) precipitant prediction methodology (for chemical precipitant loading) and the testing methodology established in the latest NRC reviewers guide for debris preparation and bed formation (Reference 10).

For BVPS-1, a series of tests was performed to obtain satisfactory results with adequate margin for head loss. The number of tests required to achieve satisfactory head loss resulted in an extended duration for the testing program. Debris quantities were varied through the series of tests. The final test that resulted in acceptable head loss requires insulation modifications for BVPS-1.

Based on test results, certain Temp-Mat™ fibrous insulation and Calcium-Silicate (Cal-Sil) insulation are required to be modified. Temp-Mat™ insulation presently installed within the reactor cavity penetrations as a transition between vessel nozzles and Reflective Metal Insulation (RMI) on the reactor coolant system piping (Hot and Cold Leg) will be replaced with RMI.

In addition, insulation modification is also scheduled for select piping presently insulated with Cal-Sil. Insulation will be replaced with RMI, removed, or banded where appropriate.

These insulation modifications will result in the remaining insulation exposed to pipe breaks and subsequent transport to the containment sump being bounded by the testing performed. Insulation modification corrective actions are scheduled to be completed during the BVPS-1 spring 2009 refueling outage (1R19).

As described above, activities to resolve the Generic Letter 2004-02 containment sump issues for BVPS-1 will not be completed by September 30, 2008, and an additional extension request is needed. Testing has been completed for BVPS-1; however, the extension is needed to provide time to plan and complete the insulation modifications for BVPS-1 and to finalize documentation for the supplemental response (including test reports and accompanying analyses) to Generic Letter 2004-02.

A follow-up supplemental response to Generic Letter 2004-02 including the results of BVPS-1 debris and chemical effects testing, results of downstream effects analyses (both in-vessel and ex-vessel), and details of corrective actions will be submitted to the NRC by October 30, 2008. This regulatory commitment is established in lieu of the BVPS-1 regulatory commitments identified in Attachment 2 (Items 1 and 5) of FENOC letter L-08-054, dated February 14, 2008 (Reference 7).

Additional required corrective actions resulting from the BVPS-1 retesting, including insulation modifications, will be implemented prior to startup following the spring 2009 refueling outage (1R19) which commences in April 2009. This regulatory commitment is established in lieu of a similar regulatory commitment identified in Attachment 2 (Item 2) of FENOC letter L-08-054, dated February 14, 2008 (Reference 7).

### **BVPS-2 BACKGROUND AND PLANNED ACTIONS**

In response to GL 2004-02, chemical effects testing was performed for BVPS-2. Based on the results of chemical effects testing conducted at the Vuez test facility the following licensing changes and modifications were planned for BVPS-2.

- Installation of baskets inside containment to support the BVPS-2 buffer change from sodium hydroxide to sodium tetraborate.
- Completion of supporting analyses and submittal of a License Amendment Request (LAR) for the BVPS-2 buffer change, and replacement of the present sodium hydroxide buffer with sodium tetraborate following LAR approval.
- Development and completion of analyses required to support application of containment overpressure to available Net Positive Suction Head (NPSH) calculations.

Implementation of the buffer change and crediting NPSH with containment overpressure was to be completed within 60 days from the LAR approval date or by the spring (March 31) 2009, whichever was sooner. Implementation was contingent on NRC approval of the LAR.

In addition to the corrective actions discussed above, insulation was to be modified and a follow-up supplemental response was to be provided and was to include the final results of the downstream effects analyses. The baskets (to hold sodium tetraborate) were installed and insulation was replaced at BVPS-2 during the spring 2008 refueling outage (2R13).

The BVPS-2 chemical effects testing performed thus far is based on the testing protocol performed by ALION at the Vuez test facility. Based on the unresolved issues regarding Vuez testing, FENOC is changing the BVPS-2 debris/chemical effects testing protocol to the same testing protocol recently used for the successful BVPS-1 testing. Changing the BVPS-2 test protocol, using the WCAP predicted precipitant loading, and introducing the debris in accordance with the March 28, 2008 NRC Reviewers Guide (Reference 10), ensures a success path for BVPS-2 compliance with GL 2004-02.

In a letter dated February 29, 2008 (Reference 8) the NRC established the due date for completion of Generic Letter 2004-02 corrective actions as March 31, 2009. Certain activities to resolve the Generic Letter 2004-02 containment sump issues have been identified for BVPS-2 that will not be completed by March 31, 2009, and an additional extension request is needed. These activities are described below.

Additional testing is required for BVPS-2. FENOC plans to retest for debris and chemical effects in the fall of 2008 using the WCAP predicted precipitant loading, and using a protocol that will include introducing debris in accordance with the March 28, 2008 NRC Reviewers Guide. The planned testing will be performed such that containment overpressure will be credited in defining an acceptable debris loading. Planned activities include updating evaluations, analysis, and documentation to reflect the new test results once testing is completed.

A follow-up supplemental response to Generic Letter 2004-02 including the results of BVPS-2 debris and chemical effects testing, results of downstream effects analyses (both in-vessel and ex-vessel), the effects on NPSH margins, and details of corrective actions will be submitted to the NRC by April 30, 2009. This regulatory commitment is established in lieu of the previous BVPS-2 regulatory commitment identified in Attachment 2 (Item 5) of FENOC letter L-08-054, dated February 14, 2008 (Reference 7), to complete downstream effects analyses and provide documented results in the follow-up supplemental response by August 30, 2008.

Based on the BVPS-1 test results, corrective actions in the form of insulation modification will be required for BVPS-2. For BVPS-2, insulation modifications may

include replacement with RMI, removal, or banding where appropriate. The BVPS-2 retesting to be performed will identify the type and quantity of insulation required to be modified. Additional required corrective actions resulting from the BVPS-2 retesting, including insulation modifications, will be implemented prior to startup following the fall 2009 refueling outage (2R14) which commences in October 2009.

The BVPS-1 testing showed little benefit in making a buffer change and therefore it was determined that a buffer change is not required for BVPS-2. As a result of FENOC's decision to change the test protocol for BVPS-2 to the same test protocol used for BVPS-1, FENOC's previous commitments to submit and implement a LAR for the BVPS-2 buffer change (that is, commitments 3 and 4 in Reference 7) are hereby withdrawn.

The BVPS-1 licensing basis presently credits containment overpressure to meet NPSH requirements. This methodology provides benefits in maintaining NPSH margins. FENOC plans to credit containment overpressure for Unit 2 consistent with the current BVPS-1 methodology. Therefore, the original commitments to submit and implement a LAR crediting containment overpressure (that is, commitments 3 and 4 in Reference 7) are replaced by a commitment to submit a LAR for NRC approval of the change to credit containment overpressure for BVPS-2 by November 9, 2008.

## **II. JUSTIFICATION FOR PROPOSED EXTENSION:**

This extension request is being submitted using the criteria of SECY-06-0078 (Reference 11) and the guidance provided in the NRC letter to the Nuclear Energy Institute dated November 8, 2007 (Reference 12). Mitigative measures to minimize the risk of degraded safety system functions are included in the supporting basis provided below. Based on the information 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.

### **JUSTIFICATION FOR CONTINUED OPERATION**

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-1 and BVPS-2 containments are compartmentalized making transport of debris to the sump difficult.
- BVPS-1 and BVPS-2 do not require recirculation from the sump during a large-break Loss-Of-Coolant Accident (LOCA) until approximately 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 requested extension period for actions to address chemical 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**

The conditions at BVPS-1 and BVPS-2 meet the criteria identified in SECY-06-0078 (Reference 11) for extension beyond the completion date specified in GL 2004-02, as discussed 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:**

The outstanding technical issues include developing the final documentation for BVPS-1 and the completion of insulation modifications during 1R19. New head loss testing is required for BVPS-2 as well as insulation modification during 2R14. The final documentation for BVPS-2 will be based on this revised testing. Activities to be completed are described below.

Activities to be completed for BVPS-1 by October 30, 2008:

- A follow-up supplemental response to Generic Letter 2004-02 including the results of BVPS-1 debris and chemical effects testing, results of downstream



effects analyses (both in-vessel and ex-vessel), and details of corrective actions will be submitted to the NRC.

Activities to be completed for BVPS-1 prior to startup following the spring 2009 refueling outage (1R19):

- Additional required corrective actions resulting from the BVPS-1 retesting, including insulation modifications, will be implemented.
- A containment coatings inspection and evaluation program for both BVPS-1 and BVPS-2 became effective in April of 2008. The Program applies to refueling outages beginning with the spring 2008 refueling outage (2R13) for BVPS-2, and the spring 2009 refueling outage (1R19) for BVPS-1.

Activities to be completed for BVPS-2 by April 30, 2009:

- A follow-up supplemental response to Generic Letter 2004-02 including the results of BVPS-2 debris and chemical effects testing (which will include credit for containment overpressure), results of downstream effects analyses (both in-vessel and ex-vessel), the effects on NPSH margins, and details of corrective actions will be submitted to the NRC.

Activities to be completed for BVPS-2 prior to startup following the fall 2009 refueling outage (2R14):

- Additional required corrective actions resulting from the BVPS-2 retesting, including insulation modifications will be implemented.
- FENOC plans implementation of containment overpressure credit as part of the BVPS-2 licensing basis upon NRC approval of the containment overpressure LAR.

**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.*

**FENOC Response:**

FENOC has installed replacement strainers and implemented significant mitigative measures to minimize the risk of degraded ECCS and CSS functions during the extension period. These mitigative measures are described below.

### **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.

### **Modifications to Reduce Flow Restrictions**

High pressure safety injection cold leg throttle valves were replaced at BVPS-1 to increase the throttle valve gap. High pressure safety injection throttle valves installed at BVPS-2 were modified to increase the throttle valve gap.

### **Operating Strategy to Reduce Fluid Velocity through Strainer**

For BVPS-1, an operating strategy that directs securing of two of four Recirculation Spray System (RSS) pumps upon transfer to cold leg recirculation has been implemented to reduce the fluid velocity through the emergency sump strainer.

### **Containment Spray System Design**

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 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 Engineered Safety Feature Actuation System (ESFAS) signal based on a Refueling Water Storage Tank (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 fall 2007 refueling outage (1R18). BVPS-2 completed the modifications associated with the RSS pump start signal during the spring 2008 refueling outage (2R13).

## **Insulation Modification**

### **BVPS-1**

New RMI was installed to replace fibrous insulation on the BVPS-1 Replacement Steam Generators (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.

Borated Temp-Mat™ insulation encapsulated in RMI on the BVPS-1 Reactor Vessel Closure Head (RVCH) was replaced with RMI during the spring 2006 refueling outage (1R17) to reduce debris loading on the sump strainer.

### **BVPS-2**

Borated Temp-Mat™ insulation encapsulated in RMI on the BVPS-2 Reactor Vessel Closure Head flange was replaced with RMI, and Min-K™ insulation encapsulated in RMI on portions of the Reactor Coolant System. Safety Injection System piping was replaced with Thermal Wrap insulation encapsulated in RMI during the spring 2008 refueling outage (2R13). These modifications reduced debris loading on the sump strainer.

## **Debris Generation**

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 to correct conditions that could otherwise increase the debris loading on the sump strainer.

## **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, mitigative measures in response to Bulletin 2003-01 "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors" (Reference 13) are in place. FENOC's response is documented in Reference 14 for BVPS-1 and BVPS-2. By letter dated September 6, 2005 (Reference 15), 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, which apply 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.
  - 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) New labels, signs, and placards to be installed inside containment at BVPS-1 and BVPS-2 are required to meet the post-LOCA environment requirements.

### **Containment Cleaning Program**

A refueling outage scheduled containment cleaning program for both BVPS-1 and BVPS-2 became effective in April of 2008 and applies to refueling outages beginning with the Spring 2008 refueling outage (2R13) for BVPS-2, and the spring 2009 refueling outage (1R19) for BVPS-1. The purpose of this Program is to remove dust, dirt, and lint from the BVPS containment buildings to assure compliance with GL 2004-02.

### **Containment Coatings Program**

A containment coatings inspection and evaluation program for both BVPS-1 and BVPS-2 became effective in April of 2008 and applies to refueling outages beginning with the spring 2008 refueling outage (2R13) for BVPS-2, and the spring 2009 refueling outage (1R19) for BVPS-1. The purpose of this Program is to assess the condition of the protective coatings on structures and equipment on the reactor containment buildings to assure compliance with NRC Generic Letter 2004-02.

### **Pressurized Water Stress Corrosion Cracking Mitigation**

Mitigation efforts at BVPS-1 and BVPS-2 have been completed for addressing the issue associated with Pressurized Water Stress Corrosion Cracking (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).

### **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 above in the FENOC Response to SECY-06-0078 Criterion No. 2.

## RISK ASSESSMENT

A risk assessment has been performed for BVPS-1 and 2 to assess the risk for the requested extension period.

The probabilistic risk assessment (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 6-inch line breaks and less will not generate significant quantities of fibrous material and cannot create a closed layer of debris coverage over the new containment sump strainers, with or without chemical effects. The containment sump screens would be considered to remain operable under 6 inch and smaller breaks. Therefore, only the large break LOCAs as modeled in the PRAs (that is, greater than 6 inches) were evaluated for vulnerability to sump blockage from debris.

The probability of a large break LOCA is very low. The Core Damage Frequency (CDF) is calculated using the large break LOCA frequency ( $7.20E-06$  per year) multiplied by the probability of a break with enough debris to cover the containment strainer, which for this assessment is conservatively considered as 1.0. The BVPS-1 large break LOCA core damage frequency is  $1.54E-08$  per year with the annual increase in CDF about  $7.18E-06$  per year. The BVPS-2 large break LOCA core damage frequency is  $1.82E-08$  per year with the annual increase in CDF about  $7.18E-06$  per year.

The Delta CDF for each Unit is:

$$7.20E-06 \text{ per year} - 1.54E-08 \text{ per year} = 7.18E-06 \text{ per year (BVPS-1)}$$
$$7.20E-06 \text{ per year} - 1.82E-08 \text{ per year} = 7.18E-06 \text{ per year (BVPS-2)}$$

These delta CDFs fall into the Region II of the acceptance guidelines for CDF in Regulatory Guide 1.174. The Regulatory Guide states that when the increase in CDF is between  $1E-06$  and  $1E-05$  per year an application will be considered only if it can be shown that the total CDF is less than  $1E-04$  per year. Since the baseline BVPS-1 CDF is  $1.95E-05$  per year and the baseline BVPS-2 CDF is  $2.40E-05$  per year the delta CDF values provided above result in new CDFs less than the  $1E-04$  per year criteria.

Large Early Release Frequency (LERF) was evaluated for large break LOCAs. The delta LERF is estimated by subtracting the conditional LERF associated with guaranteed failures of the sump screens ( $5.09E-08$  per year for BVPS-1 and  $1.25E-07$  per year for BVPS-2) from the LERF baseline value associated with probabilistic failures of the sump screens ( $1.06E-08$  per year for BVPS-1 and  $3.17E-08$  per year for BVPS-2). The annual increase in LERF is estimated to be  $4.03E-08$  per year for BVPS-1 and  $9.32E-08$  per year for BVPS-2.

The Delta LERF for each Unit is:

$5.09\text{E-}08$  per year –  $1.06\text{E-}08$  per year =  $4.03\text{E-}08$  per year (BVPS-1)

$1.25\text{E-}07$  per year –  $3.17\text{E-}08$  per year =  $9.32\text{E-}08$  per year (BVPS-2)

These delta LERF values are less than  $1\text{E-}07$  per year and fall into Region III of the LERF acceptance guidelines provided in Reg Guide 1.174. The guidelines stipulate that when the calculated increase in LERF is very small (less than  $1\text{E-}07$  per year) the change will be considered regardless of whether there is a calculation of the total LERF.

### III. 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-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.
3. 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.
4. 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.
5. 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.
6. FENOC Letter L-08-035, Supplemental Response to Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors" Dated February 29, 2008 (TAC Nos. MC4665 and MC4666)
7. FENOC Letter L-08-054, 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 Dated February 14, 2008

8. NRC letter, Beaver Valley Power Station, Units 1 and 2 Extension Request Approval Letter Re. Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized-Water Reactors" (TAC Nos. MC4665 and MC4666), dated February 29, 2008.
9. Westinghouse non-proprietary topical report WCAP-16530-NP, "Evaluation of Post-Accident Chemical Effects in Containment Sump Fluids to Support GSI-191," dated February 2006.
10. Mr. W. H. Ruland, NRC Division of Safety Systems Director, letter to Mr. A. R. Pietrangelo of the Nuclear Energy Institute, Subject: Revised Guidance for Review of Final Licensee Responses to Generic Letter 2004-02, "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors," dated March 28, 2008.
11. 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.
12. Mr. W. H. Ruland, NRC Division of Safety Systems Director, letter to Mr. A. R. Pietrangelo of the Nuclear Energy Institute, Subject: 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," dated November 8, 2007.
13. NRC Bulletin 2003-01, "Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors," dated June 9, 2003.
14. FENOC Letter L-03-117, "60-Day Response to NRC Bulletin 2003-01," dated August 8, 2003.
15. NRC letter, "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), dated September 6, 2005.



ATTACHMENT 2  
L-08-257

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 Unit No. 1 (BVPS-1) and Unit No. 2 (BVPS-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.

Regulatory Commitment

Due Date

- |  |  |
|--|--|
| 1. A follow-up supplemental response to Generic Letter 2004-02 including the results of BVPS-1 debris and chemical effects testing, results of downstream effects analyses (both in-vessel and ex-vessel), and details of corrective actions will be submitted to the NRC.   | October 30, 2008   |
| 2. Additional required corrective actions resulting from the BVPS-1 retesting including insulation modifications will be implemented.  | Prior to startup following the spring 2009 Refueling Outage (1R19) which commences in April 2009 |
| 3. A follow-up supplemental response to Generic Letter 2004-02 including the results of BVPS-2 debris and chemical effects testing (which will include credit for containment overpressure), results of downstream effects analyses (both in-vessel and ex-vessel), the effects on NPSH margins, and details of corrective actions will be submitted to the NRC. | April 30, 2009   |
| 4. Additional required corrective actions resulting from the BVPS-2 retesting including insulation modifications will be implemented.  | Prior to startup following the fall 2009 Refueling Outage (2R14) which commences in October 2009 |
| 5. Submit a license amendment request for NRC approval of the change to credit containment overpressure for BVPS-2.  | November 9, 2008   |