FENOC

FirstEnergy Nuclear Operating Company

Peter P. Sena III
Site Vice President

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

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L-07-105

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
Supplemental Information for License Amendment Request Nos. 334 and 205 (TAC Nos. MD4290 and MD4291)

By letter dated February 9, 2007 (L-07-017, Reference 1), FirstEnergy Nuclear Operating Company (FENOC) submitted License Amendment Request (LAR) numbers 334 and 205 for Beaver Valley Power Station (BVPS) Units Nos. 1 and 2, respectively. These amendment requests propose Technical Specification changes related to the Recirculation Spray System pump start signal. The proposed changes support design modifications necessary for resolution of Nuclear Regulatory Commission (NRC) Generic Safety Issue 191, "Assessment of Debris Accumulation on PWR Sump Performance" (GSI-191, Reference 2) for BVPS.

In response to an NRC Request for Additional Information dated July 3, 2007, FENOC provided supplemental information in support of the amendment requests by letter dated August 8, 2007 (L-07-095, Reference 3).

FENOC has determined that the application for amendment requires revision to reflect the correction of a non-conservative assumption used in the instrument uncertainty calculation for BVPS Unit 1. Furthermore, as discussed in the RAI response, changes are provided to clarify actions required for the realignment of the high head safety injection pumps at BVPS Unit 2. Attachment 1 provides a summary of these changes, along with revised information to supplement the original application.

Additionally, as discussed in the FENOC RAI response, FENOC hereby withdraws a proposed modification to Technical Specification (TS) Table 3.3.2-1, FUNCTION 7.b. The number of REQUIRED CHANNELS is to remain at the current value. Other proposed changes in Table 3.3.2-1 are unaffected by this withdrawal. The desired final configuration of TS Table 3.3.2-1 on page 3.3.2-12 is provided as Attachment 2.

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The proposed revisions to the license amendments do not impact or invalidate the conclusions of the safety analysis or the determination of no significant hazard consideration submitted in Reference 1.

No new regulatory commitments are contained in this submittal. If there are 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 23, 2007.

Sincerely,

Peter P. Sena III

Attachments:

1. Summary of Analysis Correction
2. Desired Final Configuration of TS Page 3.3.2-12

References:

1. FENOC Letter L-07-017, License Amendment Request Nos. 334 and 205, dated February 9, 2007.
2. NRC Generic Safety Issue 191 (GSI-191), "Assessment of Debris Accumulation on PWR Sump Performance."
3. FENOC Letter L-07-095, "Responses to a Request for Additional Information (RAI) dated July 3, 2007 in Support of License Amendment Request Nos. 334 and 205 (TAC Nos. MD4290 MD4291)," dated August 8, 2007.

c: Ms. N. S. Morgan, NRR Project Manager
Mr. D. L. Werkheiser, NRC Senior Resident Inspector
Mr. S. J. Collins, NRC Region I Administrator
Mr. D. J. Allard, Director BRP/DEP
Mr. L. E. Ryan (BRP/DEP)

Revisions to License Amendment Request (LAR) Nos. 334 and 205

FirstEnergy Nuclear Operating Company (FENOC) has identified a non-conservative assumption used in the instrument uncertainty calculation performed in support of the subject LARs. The non-conservative estimate of Refueling Water Storage Tank (RWST) level uncertainties for Recirculation Spray System (RSS) pump start is limited to Beaver Valley Power Station (BVPS) Unit No. 1 (LAR 334). The condition does not extend to BVPS Unit No. 2 (LAR 205). The correction to the instrument uncertainty calculation results in a reduction in the Net Positive Suction Head (NPSH) available to the BVPS Unit No. 1 RSS pumps of approximately 0.6 feet. The reduced available NSPH is adequate to support strainer installation. The revisions to the instrument uncertainty calculation do not require any changes to the Technical Specification amendments proposed in Reference 1.

During the preparation of the response to Question 5 of an NRC Request for Additional Information (see Reference 3), FENOC personnel identified an incorrect statement regarding realignment of high head safety injection pumps.

Previously submitted analysis, figures and tables affected by these corrections were provided in the License Amendment Requests submitted on February 9, 2007. For ease of review, revised information on affected pages, identified as Revision 1, is included in this attachment. Areas of change are marked with revision bars.

Unit 1

At Unit 1, the LHSI pumps automatically realign to take suction flow from the containment sump and supply flow to the RCS and HHSI pump suctions. Two of the four RSS pumps are located inside containment and take suction directly from the containment sump. The other two RSS pumps are outside containment and take suction from the containment sump through a dedicated line.

Unit 2

At Unit 2, the LHSI pumps automatically stop on the low-low RWST level signal and the HHSI pumps are automatically realigned to take suction from the discharge of one of the two RSS pumps on each train to continue core heat removal. The other RSS pump on each train continues to discharge to its spray header to continue lowering containment temperature and pressure. At this unit all four pumps are outside containment and re-circulated containment water is provided to each RSS pump through a dedicated inlet line from the containment sump.

Units 1 and 2

The QSS pumps take suction from the RWST and discharge to spray headers until they are manually stopped based on an RWST Low Level alarm. A low level alarm is generated when approximately 1 to 2 feet of water is left in the tank. The operators manually stop the pumps when this low level alarm is received. In addition, each RSS pump discharges to a dedicated RSS heat exchanger that is cooled by service water.

Because the RSS pumps are currently started after a relatively short time delay of approximately 300 seconds (5 minutes) at Unit 1 and 600 seconds (10 minutes) at Unit 2 following a Containment Pressure High-High signal, there is a limited quantity of water in the containment sump for ECCS recirculation. As a result there is little margin to pump net positive suction head (NPSH) limits. However, this amount of margin is adequate to support the current licensing basis for operability of ECCS for each of the BVPS units.

Current Licensing Basis

The current licensing basis methodology for calculating NPSH differs from Unit 1 to Unit 2 and is briefly described in the following paragraphs.

and therefore the pump start signal modification has no impact on the transient. Plots of the new containment pressure and temperature responses are provided in Attachment D.

4.1.2 NPSH Analysis

Calculations were performed to determine the impact of the proposed change to RSS pump start signal and installation of the containment sump strainer on the NPSH margin for the RSS and LHSI (Unit 1) pumps. Details of NPSH analysis are provided in Attachment D. The methodology for calculating available NPSH is as noted previously and is consistent with the current licensing basis. The calculations establish the available margin in available NPSH without taking into consideration the containment sump strainer head loss. As per Generic Letter 2004-02, this margin will be compared to the head loss across the containment sump strainer following completion of strainer testing with the plant specific debris loading.

Unit 1

At Unit 1, the results show a reduction in the NPSH available for the Inside Recirculation Spray (IRS) pump and an increase for the Outside Recirculation Spray (ORS) pumps. This is due to a more accurate modeling of the direct QSS flow to the pumps. The direct QSS flow to the pumps is configured such that two thirds of the flow goes to the ORS pump and one third to the IRS pump on each train. This arrangement compensates for the higher suction piping loss in the ORS pump. In the current analysis, the enhancement flow was assumed to be equally divided to the IRS and ORS pump. For the IRS pumps, the available NPSH decreased from 17.6 feet to 14.8 feet. For the ORS pumps, the available NPSH increased from 11.8 feet to 14.1 feet. The current NPSH analysis includes a screen head loss component although it is negligible based on the current 50% blockage criteria. The analysis of the modified system operation does not include a strainer head loss component. The required NPSH for all RSS pumps is 9.8 feet and therefore the margin in available NPSH is 5.0 feet for the IRS pumps and 4.3 feet for the ORS pumps based on the modified system operation.

Based on the proposed change to the start signal for the RSS pumps, the minimum water level in the containment sump at RSS pump startup will increase. The RSS pumps will start when the level in the RWST reaches a nominal setpoint of 27 feet

7.5 inches. The limiting cases for minimum containment sump water level are typically smaller breaks where some water inventory remains in the RCS. On RSS pump start, there is a slight reduction in containment water level as the system piping is filled. For the limiting case, the minimum water level above the bottom of the sump increases from 1.25 feet to 3.95 feet. This provides some benefit in available NPSH. The increased water level is needed primarily so that a strainer designed with a surface area larger than the existing screen can be submerged when flow is initiated.

The LHSI pumps at Unit 1 re-align to take flow from the containment sump in the recirculation mode of safety injection. The transfer setpoint is currently approximately 14.0 feet and will not change due to the proposed change to RSS pump start. Transfer to cold leg recirculation will occur after RSS pump start based on the transfer setpoint. Since containment overpressure is credited for the LHSI pump, the available NPSH is sensitive to the containment sump temperature. The proposed RSS start signal change causes the RSS pumps to start later during the transient and consequently less heat removal occurs and a higher sump temperature results at transfer to recirculation. This causes a reduction in the available NPSH for the LHSI pump. The available NPSH for the LHSI pump will be reduced from 27.2 feet to 16.2 feet. The required NPSH is 10.6 feet and therefore the NPSH margin is 5.6 feet. These results establish an upper limit for design of the new containment sump strainer for Unit 1 in terms of available water level at RSS pump start and available margin for head loss (4.3 feet) across the debris laden strainer.

Unit 2

At Unit 2, the increased water level at RSS pump startup increases the available NPSH. Since no containment overpressure is credited, the increased water level has a direct effect on the available NPSH. For the most limiting case, the available NPSH increased from 15.0 feet to 20.0 feet. The current NPSH analysis includes a screen head loss component although it is negligible based on the current 50% blockage criteria. The analysis of the modified system operation does not include a strainer head loss component. The required NPSH is 15.0 feet and therefore the margin in available NPSH is 5.0 feet based on the modified system operation. The minimum containment sump level increases from 2.1 feet to 6.7 feet. These results are based on starting the RSS pumps at a nominal setpoint of 32 feet 9 inches on the RWST. The nominal setpoint for transfer to recirculation is 31.7 feet and will approximately 1.0E-01, if there were a failure of a vital bus to power one of the instrument loops. If the Train A signal was successful, the increase in the Train B RSS pump conditional failure probability due to the Train B RWST Level Low signal would be approximately 1.1E-03 with or without vital bus failures.

For BVPS Unit 1, the RWST Level Low function uses the same instrumentation as the RWST Level Extreme Low function, with the exception of the RWST Level Low comparator. The RWST Level Low comparator is physically distinct but of the same type as the RWST Level Extreme Low comparator. The instrument uncertainty for the proposed RWST Level Low function has increased with respect to the RWST Level Extreme Low function. This is due to an "As Built" variance in the RWST that causes uncertainty to increase as the Nominal Trip Setpoint increases. There is no effect on the RWST Level Extreme Low function since the associated Nominal Trip Setpoint remains unchanged. The RWST Level Low instrumentation uncertainty was developed in accordance with Westinghouse Setpoint Methodology for Protection Systems for BVPS Unit 1 WCAP-11419 (Reference 11).

For BVPS Unit 2, the RWST Level Low function uses the same instrumentation as the RWST Level Extreme Low instrumentation. The RWST Level Low comparator utilizes a spare output on the same comparator card as the existing RWST Level Extreme Low output. The BVPS Unit 2 RWST does not share the "As-Built" variance identified for the BVPS Unit 1 RWST. Therefore the accuracy of the RWST Level Low actuation signal is identical to the RWST Level Extreme Low accuracy. The RWST Level Low instrumentation uncertainty was developed in accordance with Westinghouse Setpoint Methodology for Protection Systems for BVPS Unit 2 WCAP-11366 (Reference 12)

4.1.9 Core Damage Frequency and Large Early Release Frequency Effects

The increase in the core damage frequency above the baseline values due to the implementation of this proposed modification would be less than 5.0E-08 per year for each unit, which is considered to be of very low risk significance. The increase in large early release frequency would also be insignificant (less than 1.0E-11 per year), due to the dominating steam generator tube rupture and interfacing systems LOCA contributions, which bypass containment.

decreased due to the additional sump volume from the QS system during the extended delay in RSS pump start time. The sump temperatures at the switchover to cold leg recirculation increase by approximately 40°F due to the increased RSS pump start delay. Since the time between RSS pump start and switchover is reduced, less heat can be removed from the containment sump water during this period. The switchover to hot leg recirculation occurs much later (6 hours) and therefore the increase in sump temperature is much smaller (approximately 2°F). These changes in fluid temperatures will be used to evaluate the structural adequacy of the piping and support systems.

Tables D-9 and D-10 show the limiting NPSH results for the RSS and LHSI (Unit 1 only) pumps for Unit 1 and Unit 2, respectively. The available NPSH transient results for the most limiting cases are shown in Figures D-7 and D-8. Consistent with the current licensing basis, Unit 1 continues to credit containment overpressure for calculating available NPSH. At Unit 2, the analysis assumes that the sump vapor pressure is equal to containment pressure consistent with the Standard Review Plan Section 6.2.2 guidance. This is also consistent with the current licensing basis.

The Unit 1 results show a decrease in the available NPSH for the Inside Recirculation Spray (IRS) pumps and an increase for the Outside Recirculation Spray (ORS) pumps. This is primarily due to the modeling change for the direct QS injection flow as discussed above in the input changes section. The minimum NSPH margin for the RSS pumps is 4.3 feet. The Unit 1 LHSI pump available NPSH decreases when compared to the current analysis. This is due to the higher sump temperature (and vapor pressure) at switchover to cold leg recirculation. The minimum NPSH margin for the LHSI pump is 5.6 feet.

For the Unit 2 RSS pumps, the available NPSH increases when compared to the current analysis. This is due to the increase in sump level when the RSS pumps start. The NSPH margin for these pumps is 5.0 feet.

Figures D-9 and D-10 show the limiting minimum sump water level profiles for Unit 1 and Unit 2. This is an important parameter which is used to establish the design of the new strainers to ensure submergence requirements can be met. At Unit 1, the minimum water level at RSS pump start is approximately 3.95 feet above the bottom of the sump. At Unit 2, the

Table D-7 MAAP-DBA ECCS and Recirculation Spray Piping Temperatures for Unit 1.				
Case	Prior to Recirculation Spray System Start	Prior to Cold Leg Recirculation Transition	After Cold Leg Recirculation Transition	After Hot Leg Recirculation Transition(1)
6L	235°F	227°F	205.9°F	149°F
7L	235°F	226°F	198.2°F	149°F

(1) Switch to containment hot leg recirculation is assumed to be at six (6) hours from accident initiation.

Table D-8 MAAP-DBA ECCS and Recirculation Spray Piping Temperatures for Unit 2.					
Case	Prior to Recirculation Spray System Start	Prior to Cold Leg Recirculation Transition	After Cold Leg Recirculation Transition	After Hot Leg Recirculation Transition(1)	RS HX Outlet Temp. After Cold Leg Recirculation(2)
1L	211°F	209°F	206.0°F	129°F	------
2L	202°F	199°F	196.4°F	129°F	------
2L1	204°F	202°F	200.6°F	134°F	------
2L2	201°F	198°F	195.9°F	130°F	------
3L	210°F	210°F	209.4°F	114°F	115°F

(1) Switch to containment hot leg recirculation is assumed to be at six (6) hours from accident initiation.

(2) Temperature of water supplied to safety injection piping in cold and hot leg recirculation modes assuming RSS train is secured if SW train failure occurs

Table D-9 MAAP-DBA Minimum Recirculation Spray and LHSI Pump NPSH Values for LOCA for Unit 1.					
Description	Power Level, %	Single Failure	IRS NPSH (ft)	ORS NPSH (ft)	LHSI NPSH (ft)
1L-DEHL MIN SI	100.6	DG	26.3	26.3	---
1L1-DEHL MIN SI	100.6	LHSI	22.4	22.6	---
2L-DEHL MAX SI	100.6	None	22.4	22.8	---
3L-DEHL MIN SI	100.6	DG	26.1	25.1	---
4L-DEHL MAX SI	100.6	None	22.0	22.9	---
4L1-DEHL MAX SI	100.6	QS	21.6	21.0	---
6L-DEPS MIN SI	100.6	DG	14.8	14.1	16.2
7L-DEPS MAX SI	100.6	CIB	17.1	16.2	19.6
RS_12in_DG_HL(1)	100.6	DG	22.2	19.9	23.9
LHSI_05in_DG_HL(2)	100.6	DG	29.5	28.1	23.4

Single Failures – Failed Equipment

CIB	One train each, QSS, RSS
DG	One train each, SI, QSS, RSS
LHSI	One LHSI train
QS	One train of QS
(1)	Limiting case for RS pump from small and intermediate breaks
(2)	Limiting case for LHSI pump from small and intermediate breaks

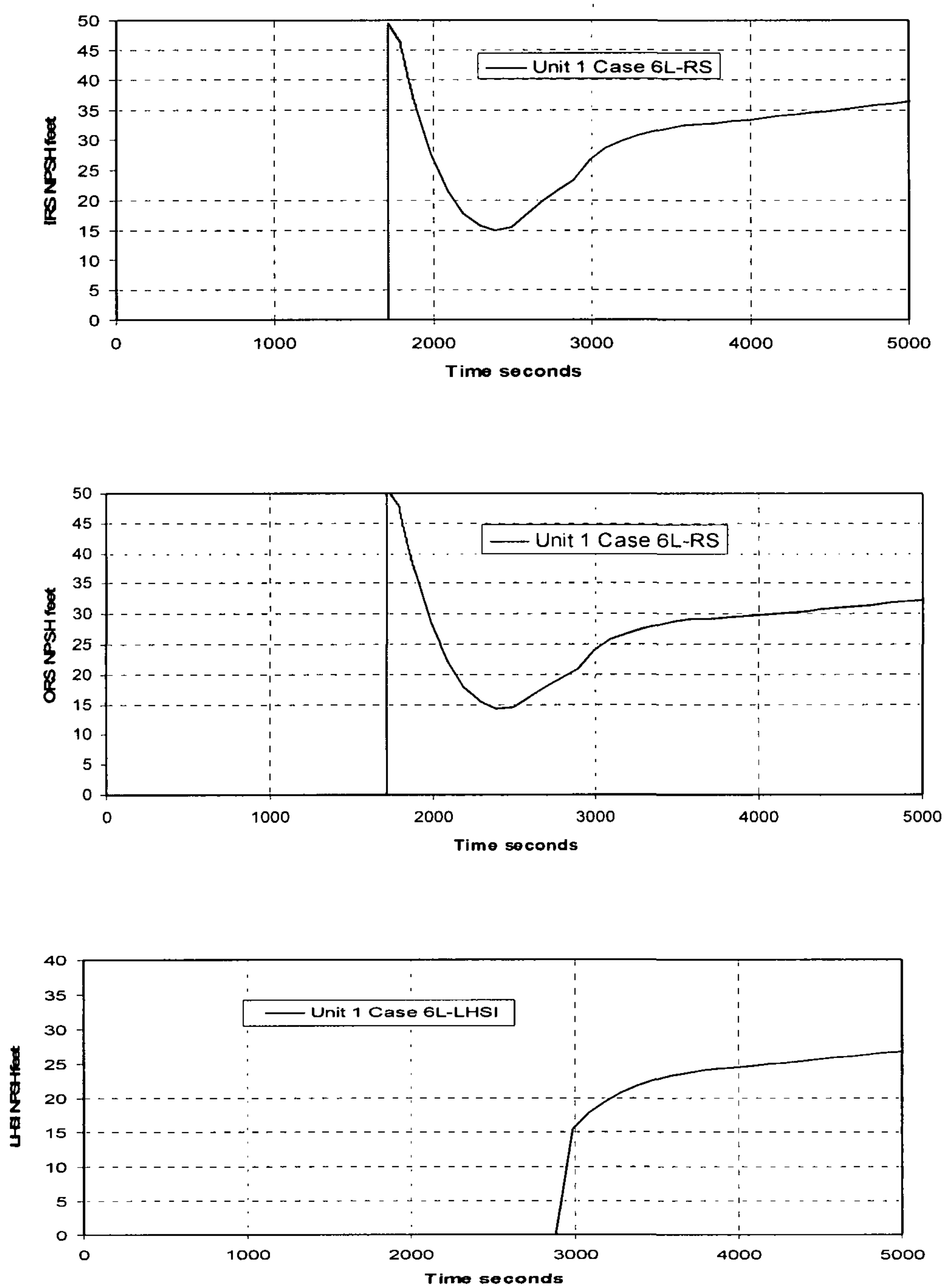

Figure D-7:
Available NPSH for Unit 1 RS and LHSI Pumps

Desired Final Configuration of Technical Specification Page 3.3.2-12

A change to the number of required channels for Technical Specification (TS) Table 3.3.2-1, FUNCTION 7.b (number of required operable instrumentation channels for the Refueling Water Storage Tanks), was previously proposed as part of License Amendment Request Nos. 334 and 205 for Beaver Valley Power Station. As indicated in Reference 3 (response to RAI item 13), this portion of the amendment request was determined to be unnecessary, and is hereby withdrawn.

The desired final configuration of TS page 3.3.2-12, identifying the remaining requested changes to TS Table 3.3.2-1, is provided on the following page.

Table 3.3.2-1 (page 5 of 6)
Engineered Safety Feature Actuation System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	UNIT 1 ALLOWABLE VALUE	UNIT 2 ALLOWABLE VALUE
6. Auxiliary Feedwater						
d. Undervoltage Reactor Coolant Pump	1,2	1 per bus	H	SR 3.3.2.5 SR 3.3.2.8 SR 3.3.2.9	≥ 2962 V	≥ 2962 V
e. Trip of all Main Feedwater Pumps	1,2	1 per pump	I	SR 3.3.2.7 SR 3.3.2.9	NA	NA
7. Automatic Switchover to Containment Sump						
a. Automatic Actuation Logic	1,2,3,4	2 trains	B	SR 3.3.2.2 SR 3.3.2.3	NA	NA
b. Refueling Water Storage Tank (RWST) Level Extreme Low ~~(Unit 1) Extreme Low (Unit 2~~)	1,2,3,4	4	J	SR 3.3.2.1 SR 3.3.2.4(e)(f) SR 3.3.2.8(e)(f)	≥ 13' 9" and ≤ 14' 4"	≥ 31' 8" and ≤ 31' 10"
Coincident with Safety Injection	Refer to Function 1 (Safety Injection) for all initiation functions and requirements.					

(e) If the as-found channel setpoint is conservative with respect to the Allowable Value but outside its predefined as-found acceptance criteria band, then the channel shall be evaluated to verify that it is functioning as required before returning the channel to service. If the as-found instrument channel setpoint is not conservative with respect to the Allowable Value, the channel shall be declared inoperable.

(f) The instrument channel setpoint shall be reset to a value that is within the as-left tolerance of the Nominal Trip Setpoint, or a value that is more conservative than the Nominal Trip Setpoint; otherwise, the channel shall be declared inoperable. The Nominal Trip Setpoint and the methodology used to determine the Nominal Trip Setpoint, the predefined as-found acceptance criteria band, and the as-left setpoint tolerance band are specified in a document incorporated by reference into the Updated Final Safety Analysis Report.