**FENOC**
FirstEnergy Nuclear Operating Company

Beaver Valley Power Station
Route 168
P.O. Box 4
Shippingport, PA 15077-0004

*M. P. Pearson*
*Director, Services & Projects*

724-682-7775
Fax: 724-682-1840

May 31, 2002
L-02-065

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

**Subject: Beaver Valley Power Station, Unit No. 1**
**Docket No. 50-334, License No. DPR-66**
**License Amendment Request No. 301**
**Positive Moderator Temperature Coefficient**

Pursuant to 10 CFR 50.90, FirstEnergy Nuclear Operating Company (FENOC) hereby requests an amendment to the above license in the form of changes to the technical specifications. The proposed change will allow operation of the reactor core with a positive moderator temperature coefficient (PMTC). The proposed change allows for improved fuel cycle management through increased flexibility in core design.

This amendment request provides economic benefit to FENOC and does not reduce the protection provided to the health and safety of the public. The change to the MTC upper limit is needed to address future core designs with higher energy requirements, associated with plant operation at higher capacity factors and power uprate conditions. Implementation of this change will reduce the need for burnable neutron absorbers required to control the MTC at the beginning of cycle life, and allow extension of the fuel cycles.

The safety analysis and no significant hazard evaluation are presented in the Enclosure. The proposed technical specification changes are presented in Attachment A. A new regulatory commitment made in the letter is presented in Attachment B.

The Beaver Valley review committees have reviewed this change. The change was determined to be safe and does not involve a significant hazard consideration as defined in 10 CFR 50.92 based on the attached safety analysis and no significant hazard evaluation.

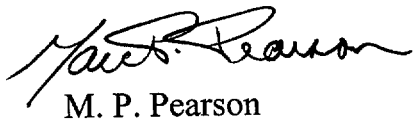
FENOC requests approval of the proposed amendment by April 1, 2003 to support unit operation following Unit 1 Refueling Outage 1R15. Once approved, the amendment shall be implemented within 60 days.

A001

If there are any questions concerning this matter, please contact Mr. Larry R. Freeland, Manager, Regulatory Affairs/Corrective Action at 724-682-5284.

I declare under penalty of perjury that the foregoing is true and correct. Executed on May 31, 2002.

Sincerely,



M. P. Pearson

Enclosure:
FENOC Evaluation of the Proposed Change

Attachments:
A. Proposed Technical Specification Changes (mark-ups)
B. List of Regulatory Commitments

c: Mr. D. S. Collins, NRR Project Manager
Mr. D. M. Kern, NRC Sr. Resident Inspector
Mr. H. J. Miller, NRC Region I Administrator
Mr. D. A. Allard, Director BRP/DEP
Mr. L. E. Ryan (BRP/DEP)

**ENCLOSURE**

**Beaver Valley Power Station, Unit No. 1**
**License Amendment Request No. 301**

FirstEnergy Nuclear Operating Company Evaluation

Subject: Application for Amendment to the Technical Specification listed in Section 2 to implement a Positive Moderator Temperature Coefficient at Beaver Valley Power Station, Unit No. 1.



Attachments

## 1.0 DESCRIPTION

FirstEnergy Nuclear Operating Company (FENOC) requests to amend Operating License DPR-66 for Beaver Valley Power Station (BVPS), Unit No. 1.

The proposed change would revise the Operating License to allow the Unit No. 1 core to be operated with a positive moderator temperature coefficient (PMTC). The proposed change reflects the current non-LOCA safety analyses assumption for the moderator temperature coefficient.

## 2.0 PROPOSED CHANGES

The proposed Technical Specification (TS) change for BVPS, Unit No. 1, which is submitted for NRC review and approval, is provided in Attachment A-1. The are no changes proposed to the TS Bases.

The proposed change to the TSs has been prepared electronically. Deletions are shown with a strike-through and insertions are shown double-underlined. This presentation allows the reviewer to readily identify the information that has been deleted and added.

To meet format requirements, the Technical Specification pages will be revised and repaginated as necessary to reflect the change being proposed by this LAR.

A change to the following TS is being proposed to allow the Unit No. 1 core to be operated with a positive moderator temperature coefficient. The proposed change reflects the current non-LOCA safety analyses assumption for the moderator temperature coefficient.

| Change | Unit No. 1 | Title |
|---|---|---|
| 1 | 3.1.1.4 | Moderator Temperature Coefficient |

The following provides a description of the proposed changes and a basis for the change.

Change No. 1

Technical Specification 3.1.1.4, Moderator Temperature Coefficient, is revised to reflect a positive moderator temperature coefficient. This change is based on the safety analyses performed and approved by the NRC for the Revised Thermal Design Procedure (RTDP) and 1.4 percent Power Uprate Programs (References 1 and 2).

Basis for Change No. 1

The analyses supporting the proposed change were previously submitted for NRC review and approved for Unit No. 1 in License Amendments 286 and 289 respectively, as documented in References 1 and 2.

## 3.0 BACKGROUND

The current Beaver Valley Power Station (BVPS), Unit No. 1 moderator temperature coefficient limit is $0 \times 10^{-4}$ $\Delta k/k/°F$. This amendment proposes to revise the TSs to allow operation of the reactor core with a PMTC. The proposed change will allow for improved fuel cycle management through increased flexibility in core design.

The proposed change revises TS 3/4.1.1.4, "Reactivity Control Systems – Moderator Temperature Coefficient (MTC)," to incorporate the change to a positive MTC. This change would revise the current MTC limit of $0 \times 10^{-4}$ $\Delta k/k/°F$, to $+0.2 \times 10^{-4}$ $\Delta k/k/°F$ for power levels up to 70 percent of rated thermal power (RTP), and ramping linearly from $+0.2 \times 10^{-4}$ $\Delta k/k/°F$ at 70 percent RTP, to $0 \times 10^{-4}$ $\Delta k/k/°F$ at 100 percent RTP in TS 3.1.1.4.

This amendment request provides economic benefit to FENOC and does not reduce the protection provided to the health and safety of the public. The change to the MTC upper limit is requested to address future core designs with higher energy requirements, associated with plant operation at higher capacity factors. Implementation of this change will reduce the need for burnable neutron absorbers required to control the MTC at the beginning of cycle life (BOL), and allow extension of the fuel cycles.

Design Bases

The limitations on MTC are provided to ensure that the assumptions used in the accident analyses remain valid through each fuel cycle. According to 10 CFR 50, Appendix A, "General Design Criteria for Nuclear Power Plants," Criterion 11, "Reactor Inherent Protection," the reactor core and its interaction with the reactor coolant system (RCS) must be designed for inherently stable power operation, even in the possible event of an accident. In particular, the net reactivity feedback in the system must compensate for any unintended or rapid reactivity increases.

The MTC relates a change in core reactivity to a change in reactor coolant temperature. A positive MTC means that reactivity increases with increasing moderator temperature; conversely, a negative MTC means that reactivity decreases with increasing moderator temperature. The reactor is currently designed to operate with a negative MTC over the entire fuel cycle. Therefore, a coolant temperature increase will cause a reactivity decrease, so that the coolant temperature tends to return toward its initial value. Reactivity increases that cause a coolant temperature increase will thus be self-limiting, and stable power operation will result.

MTC values are predicted at selected fuel usage durations (burnups) during the safety evaluation analysis and are confirmed to be acceptable by measurements. Reload cores are designed so that the BOL MTC is less positive than that allowed by the limiting condition for operation (LCO) specified in the TS. The actual value of the MTC is dependent on core characteristics, such as fuel loading and reactor coolant soluble boron concentration. The core design may require additional fixed distributed consumable poisons to yield an MTC at the BOL within the range analyzed in the plant accident analysis. The end of cycle life (EOL) MTC is also limited by the requirements of the accident analysis. Fuel cycles that are designed to achieve high burnups or that have changes to other characteristics are evaluated to ensure that the MTC does not exceed the EOC limit.

The acceptance criteria for the specified MTC are that the MTC values must remain within the bounds of those used in the accident analysis, and the MTC must be such that inherently stable power operations result during normal operation and during accidents. A power level dependent MTC has

been chosen to minimize the impact on accidents postulated to occur at higher power levels. As the power level is increased, the average coolant temperature increases tending to make the MTC more negative. Also, the boron concentration is reduced as xenon builds into the core. Therefore, PMTC becomes less of a factor as full power is approached. As fuel burnup is achieved, the boron concentration is further reduced, and the MTC will become negative over the remainder of the cycle at full power.

The total reactivity defect is composed of the reactivity defects due to fuel and moderator effects. As the core power and temperature increase, the total reactivity defect is always negative, even when the moderator defect is positive as a result of implementing a PMTC limit. Therefore, the cumulative reactivity feedback as the core power approaches 100 percent is always negative, even with a part-power positive moderator temperature coefficient of reactivity. Thus GDC 11 is met.

## 4.0 TECHNICAL ANALYSIS

Non-LOCA Analyses

The Updated Final Safety Analysis Report (UFSAR) Chapter 14 non-LOCA analyses considered a +2 pcm/°F MTC in the analyses associated with the revised thermal design procedure (RTDP), and the 1.4 percent power uprate. These analyses were submitted to the NRC for review and approval in LARs No. 286 on BVPS, Unit No. 1, Docket No. 50-334, License No. DPR-66, dated December 27, 2000, and No. 289 on BVPS, Unit No. 1, Docket No. 50-334, License No. DPR-66, dated January 18, 2001, respectively. These submittals and associated analyses serve as the analytical basis to support the proposed change to the positive MTC.

The specific events analyzed with a PMTC, as well as those events not affected by a PMTC are identified in Table 1.

**Table 1 – Summary of the Beaver Valley Power Station, Unit No. 1, Non-LOCA Analysis Initial Conditions**

| Event Name | UFSAR Section | Initial Power (MWt) | Moderator Coefficient | Discussion |
|---|---|---|---|---|
| Rod Withdrawal from Subcritical | 14.1.1 | Hot Zero Power (HZP) | +2 pcm/°F | Analysis explicitly assumes the PMTC. |
| Rod Withdrawal at Power | 14.1.2 | 2697 (100% Rated Thermal Power [RTP]; 2689 MWt plus reactor coolant pump heat)<br>1618.2 (60% RTP)<br>269.7 (10% RTP) | +2 pcm/°F | Analysis explicitly assumes the PMTC. Also, additional cases are analyzed assuming maximum (i.e., EOL) reactivity feedback including a most negative MTC. |
| Dropped Rod | 14.1.3 | Not Applicable (N/A) | N/A | This event is evaluated using generic analyses based on the approved methodology discussed in WCAP-11394-P-A. The generic analyses explicitly consider a MTC range of 0 to -35 pcm/°F and utilize an extrapolation methodology to cover the entire MTC range anticipated. PMTCs are not modeled because a PMTC provides a benefit in the analysis. |
| Boron Dilution | 14.1.4 | N/A | N/A | No explicit initial power or MTC assumption is made in this calculation. Boron concentrations and densities are assumed in the analyses, which have an implied MTC. |
| Loss of | 14.1.7 | 2697 (Departure | +2 pcm/°F | Analysis explicitly |

| Event Name | UFSAR Section | Initial Power (MWt) | Moderator Coefficient | Discussion |
|---|---|---|---|---|
| Load/Turbine Trip | | from Nucleate Boiling [DNB] Case)<br><br>2713.2 (Pressure Case) | | assumes the PMTC. The power level of 2713.2 given is 100.6% of 2697 MWt. |
| Loss of Normal Feedwater | 14.1.8 | 2713.2 | 0 pcm/°F | The power level of 2713.2 given is 100.6% of 2697 MWt. Analysis at full power with a zero MTC bounds analyses at part power with the PMTC. |
| Loss of AC Power | 14.1.11 | 2713.2 | 0 pcm/°F | The power level of 2713.2 given is 100.6% of 2697 MWt. Analysis at full power with a zero MTC bounds analyses at part power with the PMTC. |
| Feedwater Malfunction | 14.1.9 | 2697<br><br>HZP | 0.43 Δk/gm/cc | This event results in an RCS cooldown and, thus, the EOL moderator coefficient is conservative. |
| Excessive Load Increase | 14.1.10 | 2697 | N/A | Cases at both BOL and EOL conditions are considered. The transient results in a slight decrease in temperature and the PMTC results in a slight benefit. As such, BOL cases assume an MTC of zero. |
| RCS Depressurization | 14.1.15 | 2697 | +2 pcm/°F | Analysis explicitly assumes the PMTC. |

| Event Name | UFSAR Section | Initial Power (MWt) | Moderator Coefficient | Discussion |
|---|---|---|---|---|
| Steamline Break | 14.2.5.1 | HZP | See discussion | This event results in an RCS cooldown and, thus, the EOL moderator coefficient is conservative. The reactivity feedback model is verified each cycle. The PMTC would result in less severe analysis results. |
| Partial Loss of Flow | 14.1.5 | 2697 | 0 pcm/°F | Analysis at full power with a zero MTC bounds analyses at part power with the PMTC.[1] |
| Complete Loss of Flow | 14.2.9 | 2697 | 0 pcm/°F | Analysis at full power with a zero MTC bounds analyses at part power with the PMTC.[1] |
| Locked Rotor | 14.2.7 | 2697 (DNB Case)<br>2713.2 (Pressure Case) | 0 pcm/°F | Analysis at full power with a zero MTC bounds analyses at part power with the PMTC. The power level of 2713.2 given is 100.6% of 2697 MWt. |
| Rod Ejection | 14.2.6 | 2705.0<br>HZP | See discussion | The power level given is 100.6% of the nominal core power (2689 MWt). Also, this analysis models an isothermal temperature coefficient (ITC) which bounds the PMTC. This is based on the approved methodology which is discussed in WCAP-7588, Rev. 1-A. |

| Event Name | UFSAR Section | Initial Power (MWt) | Moderator Coefficient | Discussion |
|---|---|---|---|---|
| Feedline Break | 14.2.5.2 | 2713.2 | +2 pcm/°F<br><br>0.43 Δk/gm/cc | The power level of 2713.2 given is 100.6% of 2697 MWt. Analysis explicitly assumes the PMTC. Also, additional cases are analyzed assuming maximum (i.e., EOL) reactivity feedback including a most negative MTC. |
| Spurious SI | 14.1.16 | 2713.2 | 0.43 Δk/gm/cc | The power level of 2713.2 given is 100.6% of 2697 MWt. This event results in an RCS cooldown and, thus, the EOL moderator coefficient is conservative. |

(1) The Beaver Valley Unit 2 Loss of Flow analysis that was done at 70% power with a +2 PMTC, to demonstrate that the Loss of Flow analysis performed at HFP with a 0 MTC is bounding, is applicable to Beaver Valley Unit 1. The part power analysis was performed to demonstrate that the results are more limiting at HFP with a 0 MTC, than at part power with a +2 PMTC.

The results of these analyses, as well as the applicable acceptance criteria are summarized in Tables 2 through 6 below.

Table 2

| Event Name | UFSAR Section | Minimum DNBR | Peak Primary Pressure | Peak Secondary Pressure |
|---|---|---|---|---|
| Rod Withdrawal at Power | 14.1.2 | 1.370 | N/A (1) | 1171 psia |
| Partial Loss of Flow(2) | 14.1.5 | 1.787 | 2339.5 psia | 922.2 psia |
| Loss of Load | 14.1.7 | 1.72 | 2675.2 psia | 1177.4 psia |
| Rod With. From Subcritical | 14.1.1 | Limit met (3) | N/A | N/A |
| RCS Depressurization | 14.1.15 | 1.65 | N/A | N/A |

| Event Name | UFSAR Section | Minimum DNBR | Peak Primary Pressure | Peak Secondary Pressure |
|---|---|---|---|---|
| Complete Loss of Flow[2] | 14.2.9 | 1.335 | 2421.1 psia | 949.4 psia |
| Limits | --- | 1.33 | 2748.5 psia | 1208.5 psia |

[1] A generic Westinghouse evaluation addresses peak pressures for Rod Withdrawal at Power analyses.
[2] Analysis at full power with a zero MTC bounds analysis at part power with a PMTC. The Beaver Valley Unit 2 Loss of Flow analysis that was done at 70% power with a +2 PMTC, to demonstrate that the Loss of Flow analysis performed at HFP with a 0 MTC is bounding, is applicable to Beaver Valley Unit 1. The part power analysis was performed to demonstrate that the results are more limiting at HFP with a 0 MTC, than at part power with a +2 PMTC.
[3] A minimum departure from nucleate boiling ratio (DNBR) is not available. Transient statepoints are evaluated to determine whether or not the limit is met. This is repeated as part of each subsequent reload evaluation.

Table 3

| Event | UFSAR Section | Percentage of rods in DNB | Peak Primary Pressure |
|---|---|---|---|
| Locked Rotor[1] | 14.2.7 | < 18% | 2691 psia |
| Limits | --- | 18% | 2997 psia [2] |

[1] Analysis at full power with a zero MTC bounds analysis at part power with a PMTC.
[2] The peak Reactor Coolant System pressure reached during the transient is less than that which would cause stresses to exceed the faulted condition stress limits.

Table 4

| Event | UFSAR Section | Peak Pressurizer Volume ($ft^3$) |
|---|---|---|
| Loss of Normal Feed[1] | 14.1.8 | N/A [2] |
| Loss of AC Power[1] | 14.1.11 | N/A [2] |
| Limits | --- | 1457.9 |

[1] Analysis at full power with a zero MTC bounds analysis at part power with a PMTC.
[2] These events were evaluated for the RTDP and 1.4% uprating programs. An evaluation was also performed for the PMTC program. Analysis at full power with a zero MTC bounds analysis at part power with a PMTC.

Table 5

| Event | UFSAR Section | Margin to Hot Leg Boiling (°F) |
|---|---|---|
| Feedline Rupture | 14.2.5.2 | 31.2 |
| Limits | --- | 0.0 |

Table 6

| Event<br><br>Rod Ejection/Case | UFSAR Section | Max. Fuel Stored Energy |
|---|---|---|
| BOL-HZP | 14.2.6 | 173.9 |
| BOL-Hot Full Power (HFP) | --- | 313.4 |
| EOL-HZP | --- | 304.4 |
| EOL-HFP | --- | 300.9 |
| Limits | --- | 360 Btu/lb |

Anticipated Transient Without Scram (ATWS)

The regulatory requirement associated with ATWS that is applicable to BVPS, Unit No. 1, is the Final ATWS Rule, 10 CFR 50.62(b), which is specifically applicable to Westinghouse designed PWRs. The requirement of 10 CFR 50.62(b), which is the installation of an ATWS mitigation system, is met for BVPS, Unit No. 1, via the installation of AMSAC (ATWS Mitigation System Actuation Circuitry). The implementation of AMSAC for BVPS, Unit No. 1, was reviewed and approved by the NRC via Reference 3.

The analytical basis of the Final ATWS Rule, as documented in SECY-83-293 (Reference 4), are Westinghouse generic ATWS analyses documented in Westinghouse letter NS-TMA-2182 (Reference 5) and performed in response to NUREG-0460, "Anticipated Transient Without Scram for Light Water Reactors" (Reference 6). The assumed reference condition in these analyses for the MTC at HFP conditions is -8 pcm/°F, an upper limit HFP MTC condition corresponding to plant operation for 95% of the cycle. With this MTC condition, it was adequately demonstrated that the peak RCS

pressure following the RCS pressure limiting ATWS events (i.e., Loss of Load ATWS and Loss of Normal Feedwater ATWS) remained below a pressure of 3200 psig, the pressure corresponding to the ASME Service Level C stress limit as prescribed in NUREG-0460. Therefore, the Westinghouse generic ATWS analyses documented in Reference 5 satisfactorily demonstrated that on a deterministic analysis basis, the ATWS peak RCS pressure limit of 3200 psig was met for 95% of the cycle. In recent years, the 5% of the cycle that unfavorable reactivity feedback conditions could exist have been termed as the unfavorable exposure time (UET). Therefore, in assessing plant changes and licensing amendment requests, one of the primary focuses for evaluating compliance with the analysis basis of the Final ATWS Rule is ensuring that the UET in the reference case is limited to less than or equal to 5% of the cycle.

FENOC is making a commitment to limit the HFP MTC to a maximum value of -5.5 pcm/°F for 100% of the cycle, in this BVPS, Unit No. 1 +2 pcm/°F part-power positive MTC LAR. As documented in Reference 7, a HFP MTC of -5.5 pcm/°F corresponds to conditions in the reference generic Westinghouse ATWS analyses that equate to a peak RCS pressure of 3200 psig. Therefore, by conservatively meeting this HFP MTC requirement, FENOC is essentially committing to meeting a 0% UET. It should be noted that the plant configuration and conditions associated with the generic Westinghouse ATWS analysis used to establish the -5.5 pcm/°F HFP MTC value corresponding to 3200 psig are associated with a 4-Loop Westinghouse PWR with a 3423 MWt Nuclear Steam Supply System (NSSS) power rating. BVPS, Unit No. 1, is 3-Loop plant with a NSSS power of 2697 MWt. As documented in Reference 5, the 4-Loop, 3423 MWt plant configuration is conservative relative to a 3-Loop plant configuration at 2785 MWt. Therefore, the application of the generic 4-Loop ATWS analysis to establish the -5.5 pcm/°F limit is conservative with respect to BVPS, Unit No. 1. FENOC will satisfy the commitment of designing the core for BVPS, Unit No. 1, to a maximum HFP MTC of -5.5 pcm/°F by making this limit a reload core design constraint. This reload design constraint will be reflected as a limit in the BVPS, Unit No. 1, Reload Safety Analysis Checklist (RSAC) which is utilized as part of the NRC approved Westinghouse Reload Safety Evaluation Methodology (Reference 8). It should be noted that the approach of limiting the HFP MTC to a value of -5.5 pcm/°F for ATWS concerns and placing this limit as a design

constraint on the reload core design is consistent with that previously approved by the NRC and currently in use for Millstone Nuclear Power Station, Unit No. 3, for operation with a +5 pcm/°F part-power MTC Technical Specification (Reference 9). This approach was also recently approved for BVPS Unit 2 (Reference 10).

Additionally, the proposed amendment limits the MTC to +2 pcm/°F at part-power conditions from 0 to 70% RTP, and linearly decreasing from +2 pcm/°F at 70% RTP to 0 pcm/°F at 100% RTP. The MTC limit at 100% RTP remains the same as the current limit for BVPS, Unit No. 1.

As discussed previously, the reference ATWS analysis (Reference 5) assumed operation of the pressurizer power-operated relief valves (PORVs) in the determination of the -5.5 pcm/°F limit. This is consistent with the guidelines of NUREG-0460. As documented in Reference 5, the unavailability of one or more PORVs is adverse with respect to ATWS RCS pressure concerns. If a PORV is isolated early in the cycle (the first two months) when the MTC is least favorable from an ATWS standpoint, the associated RCS pressure increase could be offset by partial rod insertion if the plant is operating with the rod control system in automatic control as discussed below.

BVPS, Unit No. 1, is operated at full power with rod control in automatic control. In practice, reactor startups are performed with the control rods in manual control up to 15% power, at which time the operators may place the rod control system in automatic control. The determination of the power level when the rods are placed in automatic control is based on Senior Reactor Operator preference. However, the control rods are placed in automatic control prior to reaching full power, and typically around 50% power. Operation with the rods in automatic control is a benefit with respect to ATWS, and serves to further limit the peak RCS pressure reached during the pressure limiting Loss of Load and Loss of Normal Feedwater ATWS events.

Control Systems Margin to Trip Evaluation

The following Condition I transients were analyzed to assess the margin to trip associated for a core designed with a PMTC at BVPS, Unit No. 1:

- 50 percent load rejection from 100% of full power
- 10 percent step load increase from 90 percent power
- 5 percent/minute ramp load increase from 15 percent to 100 percent of full power
- Turbine trip without reactor trip from the P-9 setpoint

The results of the analyses confirmed that there were no challenges to the reactor trip or engineered safety feature actuation system (ESFAS) actuations during the Condition I operating transients listed above.

Therefore, based on these analyses, it is concluded that all of the normal plant operability transients can be accommodated for a core designed with a PMTC.

The current Beaver Valley Power Station (BVPS), Unit No. 1 moderator temperature coefficient limit is $0 \times 10^{-4}$ $\Delta k/k/°F$. This License Amendment Request (LAR) proposes to revise the BVPS Unit No. 1 Technical Specifications so that the Unit core may be operated with a positive moderator coefficient.

The proposed change will allow improved fuel cycle management through increased flexibility in the core design. This amendment request provides economic benefit to FENOC and does not reduce the protection provided to the health and safety of the public. The change to the MTC upper limit is requested to address future core designs with higher energy requirements, associated with plant operation at higher capacity factors. Implementation of this change will reduce the need for burnable neutron absorbers required to control the MTC at the beginning of cycle life (BOL), and allow extension of the fuel cycles.

The proposed changes are acceptable based on the safety analyses performed and approved by the NRC for the Revised Thermal Design Procedure (RTDP) and 1.4 percent Power Uprate Programs (References 1 and 2). The proposed License Amendment provides assurance that all of the applicable acceptance criteria continue to be met for each of the analyses with a PMTC.

## 5.0 REGULATORY SAFETY ANALYSIS

Beaver Valley Power Station (BVPS), Unit No. 1 is currently licensed for an MTC limit of $0 \times 10^{-4}$ $\Delta k/k/°F$. This LAR proposes to revise the BVPS, Unit No. 1 Technical Specifications so that the Unit No. 1 core may be operated with a positive moderator temperature coefficient (PMTC). The proposed change modifies TS 3/4.1.1.4, "Reactivity Control Systems – Moderator Temperature Coefficient (MTC)," to incorporate the change to a positive MTC. This change would revise the current MTC limit of $0 \times 10^{-4}$ change in reactivity per degree Fahrenheit ($\Delta k/k/°F$), to $+0.2 \times 10^{-4}$ $\Delta k/k/°F$ for power levels up to 70 percent of rated thermal power (RTP), and ramping linearly from $+0.2 \times 10^{-4}$ $\Delta k/k/°F$ at 70 percent RTP to $0 \times 10^{-4}$ $\Delta k/k/°F$ at 100 percent RTP in TS 3.1.1.4.

### 5.1 No Significant Hazards Consideration

FirstEnergy Nuclear Operating Company (FENOC) has evaluated whether or not a significant hazards consideration is involved with the proposed amendments by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

No. The proposed change from a moderator temperature coefficient (MTC) limit of $0 \times 10^{-4}$ $\Delta k/k/°F$ to a positive moderator temperature coefficient (PMTC) of $+0.2 \times 10^{-4}$ $\Delta k/k/°F$ does not introduce an initiator of any design basis accident or event. The proposed change does not adversely affect accident initiators or precursors nor alter the configuration of the facility or the manner in which the plant is maintained. Thus, the proposed change does not involve a significant increase in the probability of an accident previously evaluated.

The proposed change to a PMTC does not alter or prevent the ability of structures, systems, and components (SSCs) from performing their intended function to mitigate the consequences of an initiating event within the assumed acceptance limits. The proposed change is consistent with the safety analysis assumptions and resultant consequences. Accident analyses affected by the proposed change

have been reanalyzed and all applicable acceptance criteria have been met. Thus, the proposed change does not involve a significant increase in the consequences of an accident previously evaluated.

Therefore, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

No. The change to a PMTC does not involve a physical alteration of the plant (i.e., no new or different type of equipment will be installed), subsequently no new or different failure modes or limiting single failures are created. The plant will not be operated in a different manner due to the proposed change. All SSCs will continue to function as currently designed. Thus, the proposed change does not create any new or different accident scenarios.

3. Does the proposed change involve a significant reduction in a margin of safety?

No. The proposed change to a PMTC does not involve revisions to any safety limits or safety system settings that would adversely impact plant safety. The proposed amendment does not alter the functional capabilities assumed in a safety analysis for any SSCs important to the mitigation and control of design bases accident conditions within the facility.

All of the applicable acceptance criteria (i.e., preventing reactor coolant system [RCS] or main steam system overpressurization, maintaining the minimum departure from nucleate boiling ratio [DNBR], preventing core uncovery, preventing fuel temperatures from exceeding their limit, preventing clad damage, and limiting the number of fuel rods that enter a departure from nucleate boiling [DNB] condition) for each of the analyses affected by the proposed change continue to be met. The conclusions of the Updated Final Safety Analysis Report (UFSAR) remain valid. Thus, since the

operating parameters and system performance will remain within design requirements and safety analysis assumptions, safety margin is maintained.

Based on the above, FENOC concludes that the proposed amendment present no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2 Applicable Regulatory Requirements/Criteria

In the following paragraphs applicable criteria and acceptance limits as they are related to the proposed changes are discussed. A summary of this discussion is provided in the table below.

| **General Design Criteria** | | **Assessment** |
|---|---|---|
| 11 | Reactor inherent protection | The total reactivity defect is composed of the reactivity defects due to fuel and moderator effects. As the core power and temperature increase, the total reactivity defect is always negative, even when the moderator defect is positive as a result of implementing a PMTC limit. Therefore, the cumulative reactivity feedback as the core power approaches 100 percent is always negative, even with a part-power positive moderator temperature coefficient of reactivity. Thus GDC 11 is met. |

| **Other Regulatory Requirements** | | **Assessment** |
|---|---|---|
| 10 CFR 50.62 | Requirements for reduction of risk from anticipated transients without scram (ATWS) events for light-water-cooled nuclear power plants | A HFP MTC of -5.5 pcm/°F corresponds to conditions in the reference generic Westinghouse ATWS analyses that equate to a peak RCS pressure of 3200 psig. Therefore, by implementing a core design limit to meet this HFP MTC requirement, a 0% UET will essentially be met. |

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the

issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

## 6.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

## 7.0 REFERENCES

1) Letter from L. J. Burkhart (NRC) to L. W. Myers (FENOC), "Beaver Valley Power Station, Unit Nos. 1 and 2 – Issuance of Amendment Re: Implementation of the Revised Thermal Design Procedure, Etc. (TAC Nos. MB0848 and MB0849)," July 20, 2001.

2) Letter from L. J. Burkhart (NRC) to L. W. Myers (FENOC), "Beaver Valley Power Station, Unit Nos. 1 and 2 (BVPS-1 and BVPS-2) – Issuance of Amendment Re: 1.4-Percent Power Uprate and Revised BVPS-2 Heatup and Cooldown Curves (TAC Nos. MB0996, MB0997 and MB2557)," September 24, 2001.

3) Letter from P. S. Tam (NRC) to J. D. Sieber (Duquesne Light Company), "Beaver Valley Power Station, Units 1 & 2 – Implementation of the ATWS Rule (TAC Nos. 59070 and 62943)," May 31, 1988.

4) SECY-83-293, "Amendments to 10 CFR 50 Related to Anticipated Transients Without Scram (ATWS) Events", W. J. Dircks, July 19, 1983.

5) NS-TMA-2182, Letter from T. M. Anderson (Westinghouse) to Dr. S. H. Hanauer (NRC) dated December 30, 1979, "ATWS Submittal."

6) NUREG-0460, "Anticipated Transients Without Scram for Light Water Reactors," April 1978.

7) NS-EPR-2833, Letter from E. P. Rahe (Westinghouse) to S. J. Chilk (NRC) dated October 3, 1983, "Rulemaking on Anticipated Transients Without Scram."

8) WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," July 1985.

9) Docket No. 50-423, Letter from R. L. Ferguson (NRC) to E. J. Mroczka (Northeast Nuclear Energy Company), dated January 20, 1988, "Issuance of Amendment (TAC NOS. 60651, 66023, and 66024)."

10) Docket No. 50-412, Letter from D. S. Collins (NRC) to L. W. Myers (FirstEnergy Nuclear Operating Company), dated February 21, 2002, "Beaver Valley Power Station Unit 2- Issuance of Amendment Re: Positive Moderator Temperature Coefficient (TAC No. MB2302)."

**ATTACHMENT A**

**Beaver Valley Power Station, Unit No. 1**
**License Amendment Request No. 301**

The following is a list of the affected pages:

3/4 1-5
3/4 1-5a (new)

REACTIVITY CONTROL SYSTEMS

MODERATOR TEMPERATURE COEFFICIENT (MTC)

LIMITING CONDITION FOR OPERATION

3.1.1.4 The Moderator Temperature Coefficient (MTC) shall be:

a. ~~Less positive than $0 \times 10^{-4}$ $\Delta k/k/°F$,~~ ← INSERT 1

b. Less negative than $-5.0 \times 10^{-4}$ $\Delta k/k/°F$ at RATED THERMAL POWER.

APPLICABILITY: MODES 1 and 2*#

ACTION:

With the Moderator Temperature Coefficient outside any one of the above limits, be in HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

4.1.1.4.1 The MTC shall be determined to be within its limits by confirmatory measurements. MTC measured values shall be extrapolated and/or compensated to permit direct comparison with the above limits.

4.1.1.4.2 The MTC shall be determined at the following frequencies and THERMAL POWER conditions during each fuel cycle:

a. Prior to initial operation above 5% of RATED THERMAL POWER, after each fuel loading.

b. At any THERMAL POWER, within 7 EFPD after reaching a RATED THERMAL POWER equilibrium boron concentration of 300 ppm.

*With $K_{eff} \geq 1.0$.
#See Special Test Exception 3.10.3.

Attachment A
Beaver Valley Power Station, Unit No. 1
License Amendment Request No. 301

INSERT 1

Less positive than $+0.2 \times 10^{-4}$ $\Delta k/k/^{\circ}F$ for power levels up to 70% of RATED THERMAL POWER, with a linear ramp to $0.0 \times 10^{-4}$ $\Delta k/k/^{\circ}F$ at 100% RATED THERMAL POWER as shown in Figure 3.1-1 and

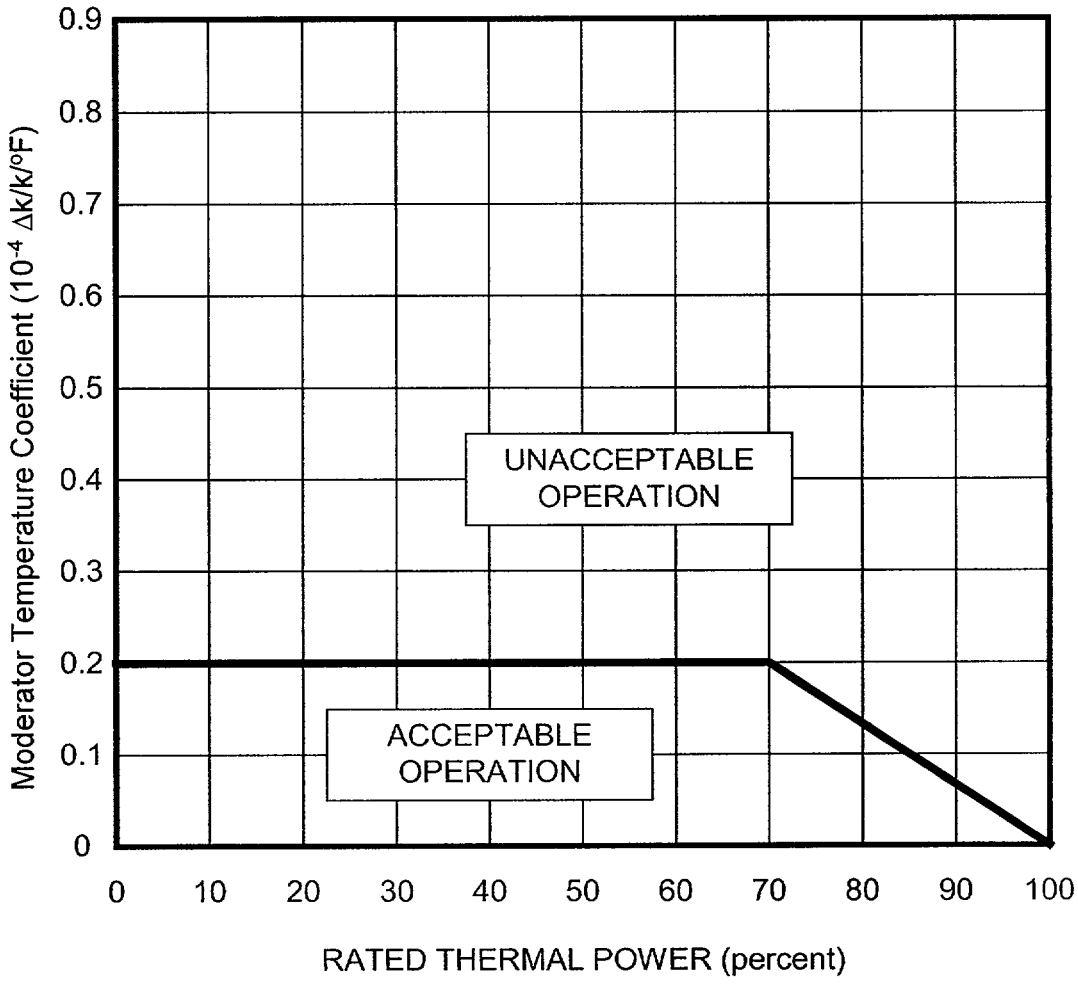



Figure 3.1-1
Moderator Temperature Coefficient versus Power Level

# ATTACHMENT B

## Beaver Valley Power Station, Unit No. 1
## License Amendment Request No. 301

Commitment Summary

Attachment B
Beaver Valley Power Station, Unit No. 1
License Amendment Request No. 301

## Commitment List

The following list identifies those actions committed to by FirstEnergy Nuclear Operating Company (FENOC) for Beaver Valley Power Station (BVPS) Unit 1 in this document. Any other actions discussed in the submittal represent intended or planned actions by Beaver Valley. These other actions are described only as information and are not regulatory commitments. Please notify Mr. Larry R. Freeland, Manager, Regulatory Affairs/Corrective Action, at Beaver Valley on (724) 682-5284 of any questions regarding this document or associated regulatory commitments.

| Commitment | Due Date |
| --- | --- |
| FENOC commits to designing reactor cores for BVPS, Unit No. 1, to a maximum hot full power moderator temperature coefficient of -5.5 pcm/°F by making this limit a reload core design constraint. This reload design constraint will be reflected as a limit in the BVPS, Unit No. 1, Reload Safety Analysis Checklist which is utilized as part of the NRC approved Westinghouse Reload Safety Evaluation Methodology. | Prior to first entry into Mode 2 for Unit No. 1 Cycle 16 operations. |