

February 21, 2002

Mr. L. W. Myers
Senior Vice President
FirstEnergy Nuclear Operating Company
Beaver Valley Power Station
Post Office Box 4
Shippingport, PA 15077

SUBJECT: BEAVER VALLEY POWER STATION, UNIT 2 - ISSUANCE OF AMENDMENT
RE: POSITIVE MODERATOR TEMPERATURE COEFFICIENT (TAC NO.
MB2302)

Dear Mr. Myers:

The Commission has issued the enclosed Amendment No. 129 to Facility Operating License No. NPF-73 for the Beaver Valley Power Station, Unit 2. This amendment consists of changes to the Technical Specifications (TSs) in response to your application dated June 28, 2001, as supplemented by letters dated September 13, 2001, December 19, 2001, and January 21, 2002. The amendment revises the TSs to allow operation with a positive moderator temperature coefficient.

A copy of the related safety evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

Daniel S. Collins, Project Manager, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-412

Enclosures: 1. Amendment No. 129 to NPF-73
2. Safety Evaluation

cc w/encls: See next page

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Package: ML020570141

TSs: ML020520694

ACCESSION NO. ML020520310 *SE provided. No major changes made.

OFFICE	PDI-1/PM	PDI-1/LA	SRXB	PDI-1/(A)SC	OGC
NAME	DCollins	M'O'Brien	FAkstulewicz*	JMunday	RWeisman
DATE	2/6/02	2/6/02	01/23/02	2/21/02	Feb. 20, 2002

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PENNSYLVANIA POWER COMPANY
OHIO EDISON COMPANY
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
THE TOLEDO EDISON COMPANY
FIRSTENERGY NUCLEAR OPERATING COMPANY
DOCKET NO. 50-412
BEAVER VALLEY POWER STATION, UNIT 2
AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 129
License No. NPF-73

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by FirstEnergy Nuclear Operating Company, et al. (the licensee) dated June 28, 2001, as supplemented by letters dated September 13, 2001, December 19, 2001, and January 21, 2002, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-73 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 129, and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated in the license. FENOC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 60 days. Additionally, administrative controls shall be established and instituted, prior to the first entry into Mode 2 for Unit 2, Cycle 10 operations, to ensure that the moderator temperature coefficient at hot full power conditions will be maintained at a value less than or equal to $-5.5 \text{ pcm}/^{\circ}\text{F}$ at all times during core life.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Joel T. Munday, Acting Chief, Section 1
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications

Date of Issuance: February 21, 2002

ATTACHMENT TO LICENSE AMENDMENT NO. 129

FACILITY OPERATING LICENSE NO. NPF-73

DOCKET NO. 50-412

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove

3/4 1-5

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Insert

3/4 1-5

3/4 1-5a

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 129 TO FACILITY OPERATING LICENSE NO. NPF-73
PENNSYLVANIA POWER COMPANY
OHIO EDISON COMPANY
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
THE TOLEDO EDISON COMPANY
FIRSTENERGY NUCLEAR OPERATING COMPANY
BEAVER VALLEY POWER STATION, UNIT 2
DOCKET NO. 50-412

1.0 INTRODUCTION

By letter dated June 28, 2001, as supplemented by letters dated September 13, 2001, December 19, 2001, and January 21, 2002, the FirstEnergy Nuclear Operating Company (FENOC; the licensee) submitted a request for changes to the Beaver Valley Power Station, Unit 2, (BVPS-2) Technical Specifications (TSs). The requested changes would permit operation with a positive moderator temperature coefficient (PMTc). The September 13, 2001, December 19, 2001, and January 21, 2002, letters provided clarifying information that did not change the scope of the request, and did not change the initial proposed no significant hazards consideration determination.

2.0 BACKGROUND

In the June 28, 2001, submittal, FENOC requested to amend TS 3/4.1.1.4, "Reactivity Control Systems - Moderator Temperature Coefficient (MTC)." The current TSs permit a maximum MTC of 0×10^{-4} change in reactivity per degree Fahrenheit ($\Delta k/k/^\circ F$) for all power levels. FENOC proposed to increase the TSs limit to $+0.2 \times 10^{-4} \Delta k/k/^\circ F$ for power levels up to 70 percent of rated thermal power (RTP) and ramping linearly to $0 \times 10^{-4} \Delta k/k/^\circ F$ from 70 percent to 100 percent RTP.

The limits for the MTC are set to ensure that a licensee does not violate the safety limits in the TSs. Improper MTC values can result in transients and accidents that exceed the safety limits for departure from nucleate boiling ratio (DNBR), peak fuel centerline temperature (FCT), or reactor coolant system pressure.

The MTC serves as an initial condition for all transient and accident analyses. It relates the change in moderator temperature to reactivity feedback. Typically, licensees operate their facilities with a negative MTC over most of each core cycle. Appendix A "General Design Criteria (GDC) for Nuclear Power Plants," Criterion 11 of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50 states the following:

The reactor core and associated coolant systems shall be designed so that in the power operating range the net effect of the prompt inherent nuclear feedback characteristics tends to compensate for a rapid increase in reactivity.

As the MTC value becomes more positive, the amount of negative reactivity feedback is reduced. The negative reactivity feedback assists in controlling transients and accidents that result in a heatup of the reactor coolant system. If the MTC is positive, the reactivity feedback during a heatup event will also be positive. The fuel temperature coefficient (FTC), which is a function of the ability of a uranium-238 atom to absorb neutrons, is always negative and offsets the adverse effects of a PMTC by adding negative reactivity during heatup events. Due to the beneficial effects of the FTC, it is possible to operate the reactor core with a PMTC for a fraction of each cycle and meet GDC 11.

3.0 EVALUATION

The licensee performed the transient and accident analyses necessary to justify the change to a PMTC during their recent 1.4-percent power uprate submittal, which the Nuclear Regulatory Commission (NRC) approved in a safety evaluation dated September 24, 2001, (Agencywide Documents Access and Management System Accession Number ML012490569). Since a PMTC will have adverse effects only on events that result in an increase in reactor coolant temperature, FENOC did not reanalyze events which caused a cooldown. The staff agrees with the licensee's conclusion about which transients did and did not require reanalysis. The licensee did not reanalyze the following events:

- 1) Feedwater Malfunction Resulting in Increased Flow (Updated Final Safety Analysis Report (UFSAR) Section 15.1.2)
- 2) Excessive Load Increase (UFSAR 15.1.3)
- 3) Steamline Break (UFSAR 15.1.5)
- 4) Dropped Rod (UFSAR 15.4.3)
- 4) Inadvertent ECCS Initiation (UFSAR 15.5.1)

3.1 Transients Reanalyzed

For all the other analyses, the licensee provided tables summarizing the initial conditions assumed for the analysis and the results. The licensee assumed initial conditions for each analysis as the most limiting power level and MTC. Although the proposal specified a power dependent MTC that would be 0 percent milli rho per degree Fahrenheit (pcm/°F) at rated thermal power (RTP), the licensee chose to use a more conservative value of +2 pcm/°F at

RTP for most of the events ($1 \text{ pcm}/^{\circ}\text{F}$ is equal to $0.1 \times 10^{-4} \Delta k/k/^{\circ}\text{F}$). This value will provide transient and accident results which bound those performed at the proposed technical specification limits. The analyses which did assume the more conservative $+2 \text{ pcm}/^{\circ}\text{F}$ limit were the loss of flow events. The loss of flow events include 1) partial loss of flow, 2) complete loss of flow, and 3) locked rotor.

The licensee used methodologies that were previously approved by the NRC as used in the accident analyses for BVPS-2, which is acceptable. The NRC staff reviewed the results of each analysis against the technical specification safety limits for BVPS-2 to ensure that the licensee continues to meet the licensing basis. The results of each analysis are found in FENOC's September 13, 2001, response to an NRC staff request for additional information (RAI) that was dated August 2, 2001. Based on the discussion provided below, the staff agrees that the safety margin is maintained and regulatory requirements continue to be met. The incidents reanalyzed and their results are as follows:

A. Rod Withdrawal from Subcritical (UFSAR 15.4.1)

The licensee assumed the initial conditions for this analysis were hot zero power with the TS MTC of $+2 \text{ pcm}/^{\circ}\text{F}$. The reanalysis demonstrated that the minimum DNBR limit continues to be met.

B. Rod Withdrawal at Power (UFSAR 15.4.2)

The initial conditions assumed for this analysis were hot full power (HFP) with the more conservative $+2 \text{ pcm}/^{\circ}\text{F}$ MTC. The results of this reanalysis showed that the minimum DNBR limit and the peak secondary pressure limits continue to be met.

C. Loss of Load/Turbine Trip (UFSAR 15.2.2/15.2.3)

The licensee assumed HFP and $+2 \text{ pcm}/^{\circ}\text{F}$ MTC for the initial conditions of this reanalysis. The results demonstrated that the minimum DNBR, peak primary pressure, and peak secondary pressure limits continue to be met.

D. Loss of Normal Feedwater (UFSAR 15.2.7)

The initial conditions for this event were HFP and the $+2 \text{ pcm}/^{\circ}\text{F}$ MTC. The licensee stated that the DNBR and peak reactor coolant pressure results are bounded by the loss of load event. In addition, FENOC's analysis showed that the pressurizer would not become water solid.

E. Loss of AC Power (UFSAR 15.2.6)

FENOC assumed HFP conditions with a $+2 \text{ pcm}/^{\circ}\text{F}$ MTC for this event. The loss of load event bounds this event for overpressurization while the loss of flow events bound it for DNBR. As with the loss of normal feedwater event, the licensee demonstrated that the pressurizer will not become water solid.

F. Reactor Coolant System (RCS) Depressurization (UFSAR 15.6.1)

The licensee assumed initial conditions of HFP and +2 pcm/°F MTC for this event. The analysis shows that the minimum DNBR limit is met.

G. Rod Ejection (UFSAR 15.4.8)

The licensee performed four analyses of this event using combinations of 1) HFP and hot zero power conditions and 2) beginning- and end-of-life cycle times. FENOC demonstrated that the maximum fuel stored energy limits are met.

H. Feedline Break (UFSAR 15.2.8)

FENOC assumed HFP and +2 pcm/°F MTC initial conditions for this event. The loss of load event bounds this event for overpressure conditions. Additionally, the licensee demonstrated that there was sufficient margin to the hot leg boiling to preclude loss of coolable geometry.

I. Partial/Complete Loss of Flow (UFSAR 15.3.1/15.3.2) and Locked Rotor (UFSAR 15.3.3)

FENOC used HFP and 0 pcm/°F MTC initial conditions for these events. To demonstrate that the HFP with 0 pcm/°F MTC results bound analyses at 70 percent RTP with +2 pcm/°F MTC results, the licensee submitted the analyses performed at the part power conditions. FENOC provided these results in their September 13, 2001, response to an NRC staff RAI and a supplemental letter dated January 21, 2002. The licensee demonstrated that the partial and complete loss of flow events will meet the limits for DNBR, peak reactor coolant pressure, and peak secondary pressure. Additionally, FENOC showed that the limits for the locked rotor event continue to be met.

3.2 Anticipated Transients Without Scram (ATWS)

In addition to reanalyzing events at BVPS-2 which are affected by operation with a PMTC, FENOC evaluated the impact of a PMTC on ATWS events. BVPS-2, as a Westinghouse plant, is required under 10 CFR 50.62 to maintain an Accident Mitigation System Actuation Circuitry (AMSAC) system. The NRC designed the requirements of 10 CFR 50.62 to prevent exceeding the American Society of Mechanical Engineers (ASME) Stress Level C Limit of 3200 pounds-per-square-inch (psig) in the RCS during an ATWS. During the rulemaking process, Westinghouse provided NS-TMA-2182, "ATWS Submittal," dated December 30, 1979, to the NRC staff, which demonstrated that a -8 pcm/°F MTC would limit the unfavorable exposure time (UET) to less than 5 percent of the cycle for a generic four-loop Westinghouse plant. The staff defined the UET as the percentage of each cycle during which the value of the MTC is insufficient to prevent exceeding 3200 psig in the RCS during an ATWS. The staff agreed with portions of NS-TMA-2182 and used some of the information provided to write 10 CFR 50.62.

In NS-EPR-2833, "Rulemaking on Anticipated Transients Without Scram," dated October 3, 1983, Westinghouse provided additional information on the effects of MTC on peak pressures during ATWS events. The letter showed that for a generic four-loop Westinghouse

plant at HFP conditions, the 3200 psig limit would not be exceeded if the MTC were more negative than $-5.5 \text{ pcm}/^{\circ}\text{F}$ and no power-operated relief valves were blocked. The four-loop Westinghouse plant is the most limiting design due to its higher rated thermal power. Since blocking power-operated relief valves will reduce the pressure relief capacity of a plant and make ATWS events more severe, FENOC assured the NRC staff that the BVPS-2 ATWS emergency operating procedures direct the operator to open any blocked power-operated relief valves.

To demonstrate BVPS-2's ability to meet the basis for the ATWS rule, FENOC has committed to implement administrative controls that will ensure the MTC is more negative than $-5.5 \text{ pcm}/^{\circ}\text{F}$ at HFP conditions at all times in core life. In their December 19, 2001, supplemental submittal, FENOC provided a graph of MTC against reactor power to demonstrate that BVPS-2 will meet the HFP limit to which it is committing. Even though BVPS-2 is a three-loop Westinghouse plant, FENOC is committing to meet the more stringent and conservative limits applicable to the generic four-loop plant considered in Westinghouse's NS-EPR-2833. FENOC's commitment will place the $-5.5 \text{ pcm}/^{\circ}\text{F}$ limit as a reload design constraint in the BVPS-2 Reload Safety Analysis Checklist (RSAC). The RSAC is employed as part of the WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," dated March 1978.

3.3 Summary

The NRC staff has reviewed the FENOC license amendment request to change the TSs at BVPS-2 to permit operation with a power dependent PMTC. Based on the evaluation set forth above, the NRC staff has found that the changes do not result in a safety margin reduction and regulatory requirements continue to be met. The NRC staff approves the use of a power-dependent PMTC which is $+0.2 \times 10^{-4} \Delta\text{k}/\text{k}/^{\circ}\text{F}$ for power levels up to 70 percent of rated thermal power (RTP) and ramps linearly to $0 \times 10^{-4} \Delta\text{k}/\text{k}/^{\circ}\text{F}$ from 70 percent to 100 percent RTP.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Pennsylvania State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (66 FR 55019). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (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.

Principal Contributor: R. Taylor

Date: February 21, 2002