



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 20, 2015

Mr. Eric A. Larson, Site Vice President
FirstEnergy Nuclear Operating Company
Beaver Valley Power Station
Mail Stop A-BV-SEB1
P.O. Box 4, Route 168
Shippingport, PA 15077

SUBJECT: BEAVER VALLEY POWER STATION, UNIT NO. 2 - ISSUANCE OF
AMENDMENT RE: REVISE TECHNICAL SPECIFICATION 4.3.2, SPENT FUEL
STORAGE MINIMUM INADVERTENT DRAINAGE ELEVATION
(TAC NO. MF4213)

Dear Mr. Larson:

The Commission has issued the enclosed Amendment No. 181 to Renewed Facility Operating License No. NPF-73 for the Beaver Valley Power Station, Unit No. 2 (BVPS-2). This amendment consists of changes to the Technical Specifications (TS) in response to your application dated June 2, 2014, as supplemented by letter dated August 8, 2014. The proposed amendment corrects the minimum drainage elevation for the spent fuel storage pool as specified in TS 4.3.2, "Drainage." In accordance with 10 CFR 50, Appendix B, Section XVI, "Corrective Action," and the FENOC Corrective Action Program, this proposed amendment resolves a TS discrepancy.

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,

A handwritten signature in black ink, appearing to read "Taylor A. Lamb".

Taylor A. Lamb, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-412

Enclosures:

1. Amendment No. 181 to NPF-73
2. Safety Evaluation

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NUCLEAR REGULATORY COMMISSION
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FIRSTENERGY NUCLEAR OPERATING COMPANY

FIRSTENERGY NUCLEAR GENERATION LLC

OHIO EDISON COMPANY

THE TOLEDO EDISON COMPANY

DOCKET NO. 50-412

BEAVER VALLEY POWER STATION, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 181
Renewed License No. NPF-73

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by FirstEnergy Nuclear Operating Company (FENOC)* acting on its own behalf and as agent for FirstEnergy Nuclear Generation, LLC, Ohio Edison Company, and The Toledo Edison Company (the licensees), dated June 2, 2014, as supplemented by letter dated August 8, 2014, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's 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 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 rules and 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.

* FENOC is authorized to act as agent for FirstEnergy Nuclear Generation, LLC, Ohio Edison Company, and The Toledo Edison Company and has exclusive responsibility and control over the physical construction, operation, and maintenance of the facility.

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 Renewed 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. 181, 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 90 days.

FOR THE NUCLEAR REGULATORY COMMISSION



Douglas A. Broaddus, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Technical Specifications
and Renewed Facility Operating License

Date of Issuance: May 20, 2015

ATTACHMENT TO LICENSE AMENDMENT NO. 181
RENEWED FACILITY OPERATING LICENSE NO. NPF-73
DOCKET NO. 50-334

Replace the following page of the Renewed Facility Operating License with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

Remove

Insert

Page 4

Page 4

Replace the following page of Appendix A, Technical Specifications, with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the area of change.

Remove

Insert

4.0-4

4.0-4

- (b) Further, the licensees are also required to notify the NRC in writing prior to any change in: (i) the term or conditions of any lease agreements executed as part of these transactions; (ii) the BVPS Operating Agreement, (iii) the existing property insurance coverage for BVPS Unit 2, and (iv) any action by a lessor or others that may have adverse effect on the safe operation of the facility.
- C. This renewed operating license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations set forth in 10 CFR Chapter 1 and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

FENOC is authorized to operate the facility at a steady state reactor core power level of 2900 megawatts thermal.

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 181 , 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.

4.0 DESIGN FEATURES

4.3 Fuel Storage (continued)

4.3.2 Drainage

Unit 1

The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 750 feet - 10 inches.

Unit 2

The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 750 feet - 10 inches.

4.3.3 Capacity

Unit 1

The spent fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 1627 fuel assemblies.

Unit 2

The fuel storage pool is designed and shall be maintained with a storage capacity limited to no more than 1088 fuel assemblies (Boraflex racks), 1690 fuel assemblies (Metamic racks).



UNITED STATES
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WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 181 TO RENEWED FACILITY OPERATING

LICENSE NO. NPF-73

FIRSTENERGY NUCLEAR OPERATING COMPANY

FIRSTENERGY NUCLEAR GENERATION, LLC

OHIO EDISON COMPANY

THE TOLEDO EDISON COMPANY

BEAVER VALLEY POWER STATION, UNIT NO. 2

DOCKET NO. 50-412

1.0 INTRODUCTION

By application dated June 2, 2014 (Reference (Ref.) 1), as supplemented by letter dated August 8, 2014 (Ref. 2), the FirstEnergy Nuclear Operating Company, et al. (the licensee), requested changes to the technical specifications (TS) for Beaver Valley Power Station, Unit No. 2 (BVPS-2). The requested change is a revision to TS 4.3.2, "Drainage," to correct the minimum drain elevation for the spent fuel storage pool. In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix B, Section XVI, "Corrective Action," and the FirstEnergy Nuclear Operating Company (FENOC) Corrective Action Program, this amendment is required to resolve a TS discrepancy regarding an existing plant design feature. The application was published in the *Federal Register* on September 30, 2014 (79 FR 58816).

2.0 REGULATORY EVALUATION

The licensee requested a change to the TS Section 4.0, "Design Features," Subsection 4.3, "Fuel Storage," Specification 4.3.2, "Drainage." This TS, for BVPS-2, states:

The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 751 feet – 3 inches.

The proposed TS change revises the specified elevation of "751 feet – 3 inches" to read "750 feet – 10 inches." During a review of operating experience, FENOC identified a discrepancy within the drawings of the spent fuel storage pool. Based on the plant drawings, the spent fuel storage pool cooling pump suction piping that passes through the spent fuel storage pool liner wall was specified at a pipe centerline elevation of 751 feet, 3 inches. The nominal inner diameter of the pipe is 10 inches; therefore, the actual lowest elevation of the inside diameter of this pipe where it enters the spent fuel storage pool is actually 750 feet, 10 inches. Elevation 750 feet, 10 inches is lower than the minimum inadvertent drainage elevation currently specified

for the spent fuel storage pool in TS 4.3.2. Therefore, FENOC issued a condition report to document and address this discrepancy and submitted this request for an amendment to correct the minimum drain elevation for the spent fuel storage pool specified in TS 4.3.2 in accordance with 10 CFR Part 50, Appendix B, Section XVI, "Corrective Action," and the FENOC Corrective Action Program to the U.S Nuclear Regulatory Commission (NRC).

The regulations in 10 CFR Part 50, Appendix B, Section XVI, "Corrective Action," state that:

Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective materials and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. The identification of the significant condition adverse to quality, the cause of the condition, and the corrective action taken shall be documented and reported to appropriate levels of management.

Criterion 61, "Fuel storage and handling and radioactivity control," of Appendix A to 10 CFR Part 50, "General Design Criteria (GDC)," states that:

The fuel storage and handling, radioactive waste, and other systems which may contain radioactivity shall be designed to assure adequate safety under normal and postulated accident conditions. These systems shall be designed (1) with a capability to permit appropriate periodic inspection and testing of components important to safety, (2) with suitable shielding for radiation protection, (3) with appropriate containment, confinement, and filtering systems, (4) with a residual heat removal capability having reliability and testability that reflects the importance to safety of decay heat and other residual heat removal, and (5) to prevent significant reduction in fuel storage coolant inventory under accident conditions.

Design provision (2) of GDC 61 directly relates to the proposed TS change. Instead of a minimum water level specification, the provision states that the system shall be designed with suitable shielding for radiation protection.

The regulations in 10 CFR 20.1201, "Occupational dose limits for adults," state, in part, that:

- (a) The licensee shall control the occupational dose to individual adults, except for planned special exposures under § 20.1206, to the following dose limits.
 - (1) An annual limit, which is the more limiting of—
 - (i) The total effective dose equivalent being equal to 5 rems (0.05 Sv); or
 - (ii) The sum of the deep-dose equivalent and the committed dose equivalent to any individual organ or tissue other than the lens of the eye being equal to 50 rems (0.5 Sv).
 - (2) The annual limits to the lens of the eye, to the skin of the whole body, and to the skin of the extremities, which are:

- (i) A lens dose equivalent of 15 rems (0.15 Sv), and
- (ii) A shallow-dose equivalent of 50 rem (0.5 Sv) to the skin of the whole body or to the skin of any extremity.

Regulatory Guide (RG) 1.13, "Spent Fuel Storage Facility Design Basis," Rev. 2 (Ref. 3), provides the guidance regarding the design basis for spent fuel storage facilities. In Rev. 2 of RG 1.13, the NRC staff had added guidance regarding radiation shielding by adequate water levels.

NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light-Water Reactor] Edition," (SRP) Sections 12.3-12.4, "Radiation Protection Design Features," Rev. 5 (Ref. 4), provides review guidance as it relates to radiation protection design features, taking into account design dose rates, anticipated operational occurrences, and accident conditions.

3.0 TECHNICAL EVALUATION

3.1 FENOC Proposed Change and Evaluation

During a review of operating experience, FENOC identified a discrepancy in the spent fuel pool storage liner. Based on plant drawings, the spent fuel storage pool cooling pump suction piping that passes through the spent fuel storage pool liner wall was specified at a pipe centerline elevation of 751 feet, 3 inches. The nominal inner diameter of the pipe is 10 inches; therefore, the actual lowest elevation of the inside diameter of this pipe where it enters the spent fuel storage pool is 750 feet, 10 inches. Elevation 750 feet, 10 inches is lower than the 751 feet, 3 inch minimum inadvertent drainage elevation currently specified for the spent fuel storage pool in TS 4.3.2.

TS Section 4.0, "Design Features," Subsection 4.3, "Fuel Storage," Specification 4.3.2, "Drainage," for BVPS-2 states that:

The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 751 feet, 3 inches.

The proposed TS change would revise the specified elevation to read:

The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below elevation 750 feet, 10 inches.

Beaver Valley Power Station, Unit No. 2 Updated Final Safety Analysis Report (UFSAR) Table 1.8-1, "USNRC Regulatory Guides," states that the design of the spent fuel storage facilities follows the guidance in RG 1.13, Rev. 1 (Ref. 5). BVPS-2 UFSAR Section 9.1.2.3, "Safety Evaluation," states in part that:

In accordance with Regulatory Guide 1.13, the storage and handling of fuel in the fuel building is designed to protect the fuel, limit potential offsite exposures, and prevent loss of water from the [spent] fuel [storage] pool which may uncover the fuel.

The spent fuel [storage] pool is designed such that the water level in the pool cannot be decreased below the top of the fuel stored in the spent fuel racks. The fuel transfer gates do not extend below the top of the spent fuel assemblies, and all piping and piping penetrations of the spent fuel [storage] pool terminate no lower than 10 feet above the top of the fuel stored in the racks.

This UFSAR reference to “the fuel stored in the racks” refers to the top of the active fuel stored in the racks. The current TS value of 751 feet, 3 inches is more than 10 feet above the top of the fuel pellets stored in the racks but less than 10 feet above the top of the fuel assemblies.

Section 9.1.3.3, “Safety Evaluation,” of the BVPS-2 UFSAR, states, in part, that:

Water level in the spent fuel [storage] pool cannot be lowered below 10 feet above the top of the fuel stored in the spent fuel racks due to the design of the pool, as described in Section 9.1.2, and by the design of the piping, which does not allow any piping termination below this elevation.

While investigating whether a minimum of 10 feet of water coverage is provided above the top of the fuel stored in the spent fuel storage pool racks, it was discovered that certain racks are higher than expected due to shimming, and the active nuclear fuel pellet stack in the spent fuel assemblies can grow due to irradiation. The rack shims and the fuel pellet growth were found to reduce the minimum water coverage over the fuel in the spent fuel storage pool by approximately 0.7 inches and 1.24 inches, respectively. As such, while the proposed TS change would revise the minimum water level over the active fuel when drained to the proposed TS minimum inadvertent drain level of 750 feet, 10 inches (an elevation difference of 5 inches), the effective amount of suitable shielding for radiation protection is further reduced due to rack shims and fuel pellet growth and is approximated to be 9.89 feet (3 meters).

If the spent fuel storage pool water level was inadvertently reduced through maloperation or piping failure, the water level could drain from the normal spent fuel level to the 750 feet, 10 inch elevation. If the TS 4.3.2 minimum inadvertent drainage elevation was revised to reflect the actual spent fuel storage pool design, there would be approximately 9.89 feet of water remaining above the top of the active fuel stored in the spent fuel storage pool racks. For evaluation purposes, FENOC assessed the dose rate with an assumed 3 meters (9.84 feet) of water coverage because it bounds the minimum water level of approximately 9.89 feet over the top of the active fuel even if the spent fuel storage pool was inadvertently drained to 750 feet, 10 inches.

In order to assess whether GDC 61 is met to ensure adequate safety for occupational workers during an inadvertent spent fuel draining event, FENOC assumed a dose receptor location directly above freshly discharged fuel assemblies at the fuel building operating deck elevation of 767 feet, 10 inches. The calculated gamma radiation dose rate was estimated to be approximately 280 millirem per hour. This is an approximate 51 millirem per hour increase in the radiation dose rate. The calculated dose rate is comparable to dose rates for certain outage maintenance activities. For instance, during the fall 2012 outage, the maximum under head inspection dose rate was measured at 185 millirem per hour while maximum steam generator channel head work dose rate was measured at 853 millirem per hour. FENOC states that this calculation result can be used to estimate operator exposure for post drain-down event

mitigation activities and permits corrective maintenance to be performed within occupational dose limits of 10 CFR 20.1201.

FENOC concluded that the spent fuel storage pool water elevation of 750 feet, 10 inches provides adequate shielding for radiation protection as required by GDC 61.

3.2 NRC Staff Evaluation

The NRC staff evaluated FENOC's proposed changes to the TS to correct the minimum drain elevation for the spent fuel storage pool specified in TS 4.3.2. The NRC staff performed a confirmatory analysis to calculate the gamma radiation dose rate for personnel located at the fuel building operating floor elevation, directly above freshly discharged fuel assemblies stored in the spent fuel storage pool with the pool water level reduced to the 750 feet, 10 inch elevation.

The NRC staff's analysis was based on information obtained from FENOC's response, dated August 8, 2014, to the NRC staff's request for supplemental information to support FENOC's June 2, 2014, correspondence. FENOC provided the methodology, critical design inputs, and assumptions for its dose calculations. The NRC staff performed a confirmatory analysis and independent verification of FENOC's results.

Based upon the above, the NRC concludes that the licensee can administratively control the gamma radiation dose for personnel located directly above freshly discharged fuel assemblies at the fuel building operating deck elevation of 767 feet, 10 inches, and can continue to meet the occupational dose limits of 10 CFR 20.1201. Therefore, the NRC staff concludes that the spent fuel storage pool water elevation of 750 feet, 10 inches provides adequate shielding for radiation protection as required by GDC 61.

3.3 NRC Staff Conclusion

The NRC staff reviewed the assumptions, inputs, and methods used by FENOC to assess the radiological impacts of the proposed changes. In doing this review, the NRC staff relied upon information placed on the docket by FENOC, staff experience in doing similar reviews, and the NRC staff's confirmatory calculations. The staff finds that FENOC's proposed changes use analysis methods and assumptions consistent with the conservative guidance of RG 1.13, Rev. 2, and NUREG-0800, Sections 12.3-12.4. The NRC staff compared the dose rate estimated by FENOC to the confirmatory analyses by the staff. The staff finds that FENOC's estimates of the gamma radiation dose rate for personnel located at the fuel building operating floor elevation, directly above freshly discharged fuel assemblies stored in the spent fuel storage pool with the pool water level reduced to the 750 feet, 10 inch elevation, will be sufficiently low enough such that the requirements of the occupational dose limits of 10 CFR 20.1201 can continue to be met. Therefore, the NRC staff concludes that the spent fuel storage pool water elevation of 750 feet, 10 inches provides suitable shielding for radiation protection as required by GDC 61. The staff finds that BVPS-2, as modified by this proposed change, will continue to provide sufficient safety margins with adequate defense-in-depth to address unanticipated events and to compensate for uncertainties in accident progression and in analysis assumptions and parameters.

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 (79 FR 58816, September 30, 2014). 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) there is reasonable assurance that 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.

7.0 REFERENCES

1. FirstEnergy Nuclear Operating Company, "Revise Technical Specification 4.3.2, Spent Fuel Storage Pool Minimum Inadvertent Drainage Elevation," Docket No. 50-412, June 2, 2014, Agencywide Documents Access and Management System (ADAMS) Accession No. ML14153A388.
2. FirstEnergy Nuclear Operating Company, "Response to Request for Supplemental Information Regarding Spent Fuel Storage Pool Minimum Inadvertent Drainage Elevation License Amendment Request (TAC No. MF4213)," Docket No. 50-412, August 8, 2014, ADAMS Accession No. ML14223A540.
3. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.13, Revision 2, "Spent Fuel Storage Facility Design Basis," March 2007, ADAMS Accession No. ML070310035.
4. U.S. Nuclear Regulatory Commission, NUREG-0800, Sections 12.3-12.4, Rev. 5, "Radiation Protection Design Features," May 2008, ADAMS Accession No. ML13151A475.

5. U.S. Nuclear Regulatory Commission, Regulatory Guide 1.13, Revision 1, "Spent Fuel Storage Facility Design Basis," December 1975, ADAMS Accession No. ML003739943.

Principle Contributors: E. Dickson, DRA
G. Curran, NRO

Date: May 20, 2015.

May 20, 2015

Mr. Eric A. Larson, Site Vice President
FirstEnergy Nuclear Operating Company
Beaver Valley Power Station
Mail Stop A-BV-SEB1
P.O. Box 4, Route 168
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Sincerely,
/RA/

Taylor A. Lamb, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
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Docket No. 50-412

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