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

May 4, 2012

Mr. Paul A. Harden
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 NOS. 1 AND 2 – REQUEST FOR ADDITIONAL INFORMATION REGARDING THE ESTIMATED EFFECT ON PEAK CLADDING TEMPERATURE RESULTING FROM THERMAL CONDUCTIVITY DEGRADATION IN THE WESTINGHOUSE - FURNISHED REALISTIC EMERGENCY CORE COOLING SYSTEM EVALUATION (TAC NOS. ME8409 AND ME8410)

Dear Mr. Harden:

By letter dated March 16, 2012 (Agencywide Document Access and Management System (ADAMS) Accession No. ML12079A111), FirstEnergy Nuclear Operating Company (FENOC, the licensee), submitted a response to a U.S. Nuclear Regulatory Commission (NRC) information request made pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Paragraph 50.54(f), for Beaver Valley Power Station, Units 1 and 2. The 10 CFR 50.54(f) request was related to the estimated effect on peak cladding temperature resulting from thermal conductivity degradation in the Westinghouse-furnished realistic emergency core cooling evaluation. Your March 16, 2012, letter also stated that the response served as a 30-day report of a significant emergency core cooling system evaluation model change or error, in accordance with requirements of 10 CFR 50.46(a)(3).

The U.S. Nuclear Regulatory Commission staff has been reviewing the March 16, 2012, letter and has determined that additional information is needed to complete its review. The specific questions are found in the enclosed request for additional information (RAI). The questions were sent via electronic transmission on April 23, 2012, to Mr. Phil Lashley, of your staff. The draft questions were sent to ensure that the questions were understandable, the regulatory basis was clear, and to determine if the information was previously docketed. The draft questions were discussed in a teleconference with your staff on May 2, 2012. It was agreed that a response to this RAI would be submitted by June 11, 2012.

Please contact me at 301-415-2833, if you have any questions.

Sincerely,

Peter Bamford

Peter Bamford, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-334 and 50-412

Enclosure:
As stated

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REQUEST FOR ADDITIONAL INFORMATION

BEAVER VALLEY POWER STATION, UNIT NOS. 1 AND 2

10 CFR 50.46, 30-DAY REPORT

DOCKET NOS. 50-334 and 50-412

By letter dated March 16, 2012 (Agencywide Document Access and Management System (ADAMS) Accession No. ML12079A111), FirstEnergy Nuclear Operating Company (FENOC, the licensee), submitted a response to a U.S. Nuclear Regulatory Commission (NRC) information request made pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Paragraph 50.54(f), for Beaver Valley Power Station (BVPS), Units 1 and 2. The 10 CFR 50.54(f) request was related to the estimated effect on peak cladding temperature (PCT) resulting from thermal conductivity degradation (TCD) in the Westinghouse furnished realistic emergency core cooling evaluation. The licensee also stated that this response served as a 30-day report of a significant emergency core cooling system evaluation model change or error in accordance with requirements of 10 CFR 50.46(a)(3). In order for the NRC staff to complete its review of the 10 CFR 50.46 report, a response to the following request for additional information is requested.

1. For BVPS, Unit 1, provide a table of data that includes the following Automated Statistical Treatment of Uncertainty Method (ASTRUM) inputs for the Analysis of Record (AOR) and integrated analyses: (1) AOR Run #, (2) TCD Run #, (3) PCT, (4) Time of PCT, (5) heat flux hot channel factor (Fq), (6) enthalpy rise hot channel factor (FdH), (7) Cycle Burnup, (8) PCT, and time of PCT, for Cases A and B.

2. For BVPS, Unit 1, please highlight the limiting cases in the ASTRUM run matrices and explain how these cases were chosen. Provide details and explain the approach used to estimate: (1) the effects of TCD, and (2) the compensating model changes. Justify the selection of the number of WCOBRA/TRAC cases that were re-executed, as opposed to a larger number of cases.

3. For BVPS, Unit 1, justify the containment pressure changes made to obtain margin. Provide reference to excerpts from the applicable methodologies to clarify the response.

4. For BVPS, Unit 2, justify the evaluation of reduced peaking factors at beginning-of-life conditions to obtain analytic margin to offset the TCD effect. Show that peaking factor reductions affect PCT in a manner that is substantially independent of fuel burnup.

5. The submittal dated March 16, 2012, references a March 7, 2012, letter sent by Westinghouse Electric Company (Westinghouse) to the NRC.[1] Regarding this letter, please answer the following:

   a. The final paragraph on Page 2 of 9 of the Enclosure (LTR-NRC-12-27 NP[P]-Enclosure) refers to small differences in fuel characteristics that were claimed to be compared. The paragraph also discusses confirmatory evaluations

1. The Westinghouse letter, and a non-proprietary version of its enclosure, may be found at ADAMS Accession No. ML12072A035.

concluding that other operating characteristics were acceptable. Provide the results of this comparison for BVPS, Units 1 and 2, including the relevant conclusions and the technical basis supporting those conclusions. For any conclusion that differences in a particular fuel or operating characteristic are offset by other conservatisms, list those conservatisms and provide a quantitative estimate of each conservatism, as well as a brief description of the rigor associated with that estimate.

b. Please provide the values for the coefficients used in the PAD 4.0+TCD uranium dioxide thermal conductivity equation.

c. Please explain any error corrections, code improvements, and miscellaneous code cleanup between the WCOBRA/TRAC and HOTSPOT code versions used in the TCD evaluations and those used in the plant's AOR.

d. What is the thermal conductivity model impact of code version changes in HOTSPOT, as described on page 5 of 9 of the Enclosure (LTR-NRC-12-27 NP-Enclosure)?

e. Explain the differences between the HOTSPOT and PAD thermal conductivity models and the impact of those differences. The NRC staff requests that graphs or other quantified descriptions that aid in explanation be provided.

f. Please provide additional detail concerning the steady-state ASTRUM/CQD [Code Qualification Document] initialization process. In particular, please explain what fuel characteristics are adjusted within the applicable models to obtain convergence among HOTSPOT, WCOBRA-TRAC, and PAD 4.0+TCD.

6. Please explain how the changed design values will be verified during operation of the plant, i.e., Technical Specification limits, Surveillances, etc. Also, explain what compensatory actions will be taken if a value is found to be outside of the limits assumed in the analysis.

7. At the bottom of Pages 1 and 5 of Attachment 2 to the letter dated March 16, 2012, it is stated that "FirstEnergy Nuclear Operating Company and its vendor Westinghouse, utilize processes which ensure that the LBLOCA [Large Break Loss-of-Coolant Accident] analysis input values conservatively bound the as-operated plant values for those parameters." Please explain these processes.

8. Based on the NRC's review of the March 16, 2012, submittal it appears that the licensee has revised inputs to a method of evaluation as described in the final safety analysis report (as updated) used in establishing the design bases or in the safety analyses.

   Revision 1 to [Nuclear Energy Institute] NEI 96-07, "Guidelines for 10 CFR 50.59 Implementation," Section 3.8, "Input Parameters," provides clarifying information concerning whether an input parameter is considered to be an element of a methodology for the purposes of addressing the applicable requirements found at 10 CFR 50.59, "Changes, Tests, and Experiments." Address whether the methodology permits the licensee to establish how to select the value of an input parameter to yield adequately conservative results and whether the revised value is more conservative than that required by the selection method.

Also, address whether any of the changes (i.e., to the UO2 thermal conductivity equation) constitutes a change in the calculational framework used for evaluating behavior or response of a system, structure or component. Explain whether, and how, 10 CFR 50.59(c)(4) might apply to such a change.

Please contact me at 301-415-2833, if you have any questions.

Sincerely,

/ra/

Peter Bamford, Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-334 and 50-412

Enclosure:
As stated

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