



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

August 10, 2015

Mr. Joseph M. Frisco, Jr.
Vice President of Nuclear Engineering
Duke Energy Corporation
Mail Code EC07H
P.O. Box 1006
Charlotte, NC 28201-1006

SUBJECT: DUKE ENERGY PROGRESS, INC., FOR H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2, AND SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1 - REQUEST FOR ADDITIONAL INFORMATION REGARDING APPLICATION TO REVISE TECHNICAL SPECIFICATIONS FOR METHODOLOGY REPORT DPC-NE-2005-P, REVISION 5, "THERMAL-HYDRAULIC STATISTICAL CORE DESIGN METHODOLOGY" (TAC NOS. MF5872 AND MF5873)

Dear Mr. Frisco:

By letter dated March 5, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15075A211), Duke Energy Progress, Inc. (Duke Energy, the licensee), submitted a request, in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.90, for H. B. Robinson Steam Electric Plant, Unit No. 2 (Robinson) and Shearon Harris Nuclear Power Plant, Unit 1 (Harris) to amend their technical specifications to adopt the methodology report DPC-NE-2005-P, Revision 5, "Thermal-Hydraulic Statistical Core Design Methodology."

The U.S. Nuclear Regulatory Commission (NRC) staff is reviewing the licensee's submittal and has determined that additional information is needed to complete its review. The enclosed document contains this request for additional information (RAI). The RAI was e-mailed to the licensee in draft form on July 17, 2015 (ADAMS Accession No. ML15212A238), and your staff determined no clarification call was needed. Your staff confirmed the RAI did not include proprietary or security-related information and an RAI response date of September 1, 2015, was agreed upon.

The NRC staff considers that timely responses to RAIs help ensure sufficient time is available for staff review and contribute toward the NRC's goal of efficient and effective use of staff resources. Please note that if you do not respond to this request by the agreed-upon date or provide an acceptable alternate date, we may deny your application for amendment under the provisions of 10 CFR 2.108.

J. Frisco

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If circumstances result in the need to revise the agreed upon response date or have any questions, please contact me at 301-415-2760 or Martha.Barillas@nrc.gov.

Sincerely,



Martha Barillas, Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-261 and 50-400

Enclosure:
Request for Additional Information

cc w/enclosure:
Mr. Benjamin C. Waldrep
Site Vice President
Shearon Harris Nuclear Power Plant
5413 Shearon Harris Road
New Hill, NC 27562-0165

Mr. Richard Michael Glover
Site Vice President
H. B. Robinson Steam Electric Plant
Duke Energy
3581 West Entrance Road, RNPA01
Hartsville, SC 29550

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REQUEST FOR ADDITIONAL INFORMATION
DUKE ENERGY PROGRESS, INC. FOR
H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2
SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1
PROPOSED CHANGES TO TECHNICAL SPECIFICATIONS TO ADOPT
METHODOLOGY REPORT DPC-NE-2005-P, REVISION 5, "THERMAL-HYDRAULIC
STATISTICAL CORE DESIGN METHODOLOGY"
DOCKET NOS. 50-261 AND 50-400

By letter dated March 5, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15075A211), Duke Energy Progress, Inc. (Duke Energy) submitted a request in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.90, for H. B. Robinson Steam Electric Plant, Unit No. 2 (Robinson) and Shearon Harris Nuclear Power Plant, Unit 1 (Harris) to amend their technical specifications (TSs) to adopt the methodology report DPC-NE-2005-P, Revision 5, "Thermal-Hydraulic Statistical Core Design Methodology." Duke Energy's statistical core design (SCD) methodology is described in the base DPC-NE-2005-PA report, which was originally approved by the NRC in 1995.¹ Subsequent revisions have added appendices containing plant-specific data that apply the SCD methodology to individual Duke Energy plants and particular fuel types. The proposed revision to this report consists of Appendices H and I that apply this methodology to Robinson and Harris, respectively. In its submittal, Duke Energy also requested the adoption of DPC-NE-2005-P, Revision 5, into the Harris and Robinson TSs Core Operating Limits Report (COLR) reference lists located in TSs 5.6.5.b and 6.9.1.6.2, respectively.

The SCD methodology proposed for use at Harris and Robinson describes a means of calculating a statistical limit on the departure from nucleate boiling ratio (DNBR), below which fuel failure may occur. General Design Criterion (GDC) 10 from 10 CFR, Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," requires licensees to ensure that specified acceptable fuel design limits, such as this DNBR limit, are not exceeded during normal operation, including the effects of anticipated operational occurrences. In order to assure compliance with GDC 10, the NRC staff is requesting the following additional information:

¹ The NRC's safety evaluation for DPC-NE-2005-PA, Revision 0, may be found in pages 33 to 46 of DPC-NE-2005-A, Revision 3 (ADAMS Accession No. ML023090299).

Enclosure

SNPB-RAI-1: For both Harris and Robinson, Duke Energy proposed the use of the HTP critical heat flux (CHF) correlation. The HTP CHF correlation is described in EMF-92-153(P)(A), "HTP: Departure from Nucleate Boiling Correlation for High Thermal Performance Fuel," Revision 1² (References H-4/I-4 of Attachments 6 and 7 of Duke Energy's submittal) and was developed in the XCOBRA-IIIC code. As discussed in the submittal, Duke Energy has implemented the HTP correlation in the VIPRE-01 code, which is described in EPRI NP-2511-CC-A, "VIPRE-01: A Thermal Hydraulic Code For Reactor Cores"³ (Reference H-3/I-3 of Attachments 6 and 7 of the submittal).

Due to modeling differences between VIPRE-01 and XCOBRA-IIIC, the HTP critical heat flux correlation as implemented in VIPRE-01 is different from the one previously developed by AREVA and approved by the NRC. The NRC staff requests that Duke Energy provide the benchmarking data for the VIPRE-01 HTP implementation (i.e., the calculations and experimental data presented in Figures H-3 through H-6 and I-3 through I-6 of submittal Attachments 6 and 7). The data provided should specifically correspond to the data presented and Tables 3.8, 3.9, A.8, and A.9 of Reference H-4/I-4 of submittal Attachments 6 and 7, EMF-92-153(P)(A), Revision 1.

SNPB-RAI-2: As discussed in submittal Attachments 6 and 7, the VIPRE-01 model proposed for use in the SCD analysis at Robinson and Harris is based on one contained in DPC-NE-3000-PA, "Thermal-Hydraulic Transient Analysis Methodology," Revision 5a (Reference H-1/I-1 of Attachments 6 and 7 to the submittal). Please provide Revision 5a of DPC-NE-3000-PA.

SNPB-RAI-3: Duke Energy provided statepoints for the SCD analysis at Robinson and Harris in Tables H-4 and I-4 of submittal Attachments 6 and 7. Please provide the following information:

- (a) How the statepoints were selected and determined to be potentially limiting with respect to critical heat flux concerns;
- (b) How the statepoints are used in the SCD analysis, and how it will be determined whether or not to evaluate the minimum DNBR from a particular transient analysis case against the SCD limit; and
- (c) The relationship between the axial peak and radial peaking (F_z and $F_{\Delta H}$) from Tables H-4 and I-4 and the peaking factors presented in the Robinson and Harris COLRs.

SNPB-RAI-4: Duke Energy provided the uncertainties used in the SCD analysis at Robinson and Harris in Tables H-5 and I-5 of submittal Attachments 6 and 7. The same tables also included brief justifications; however, several of these justifications

² ADAMS Accession Nos. ML051020017 (non-proprietary) and ML051020019 (proprietary).

³ ADAMS Accession Nos. ML102090545, ML102090544, ML102090543, and ML102070202 (proprietary).

require additional detail and as well as further justification of the magnitudes of the uncertainties. Please provide additional discussion and quantitative justification for the proposed uncertainties for the following parameters: coolant flow measurement, bypass flow, pressure, axial peaking factor, and axial peak location. Provide additional discussion of how the code/model uncertainty was determined.

SNPB-RAI-5: Duke Energy provided results from two different sets of statepoints in Tables H-6 and I-6 of submittal Attachments 6 and 7. In one set, 500 case runs were performed for statepoints, while 5,000 case runs were performed for statepoints in the other set, which is a subset of the first.

- (a) How were the 5,000-run statepoints selected from the set of 500-run statepoints?
- (b) Why are the higher statistical design limits from the set of 500-run statepoints not considered in the determination of the final statistical design DNBR limit?

If circumstances result in the need to revise the agreed upon response date or have any questions, please contact me at 301-415-2760 or Martha.Barillas@nrc.gov.

Sincerely,

/RA/

Martha Barillas, Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
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ADAMS Accession No.: ML15215A651

*by e-mail

OFFICE	LPL2-2/PM	LPL2-2/LA	NRR/DSS/SNPB*	LPL2-2/BC	LPL2-2/PM
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DATE	08/05/15	08/05/15	07/17/15	08/09/15	08/10/15

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