



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001**

September 26, 2019

Ms. Margaret M. Doane  
Executive Director for Operations  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**SUBJECT:** SAFETY EVALUATION OF WESTINGHOUSE TOPICAL REPORT  
WCAP-17794-NP, REVISION 0, "10X10 SVEA FUEL CRITICAL POWER  
EXPERIMENTS AND NEW CPR CORRELATION: D5 FOR SVEA-96  
OPTIMA3"

Dear Ms. Doane:

During the 666<sup>th</sup> meeting of the Advisory Committee on Reactor Safeguards, September 4-6, we reviewed the staff's safety evaluation report of Westinghouse Electric Company Topical Report WCAP-17794-P, Revision 0, "10X10 SVEA Fuel Critical Power Experiments and New CPR Correlation: D5 for SVEA-96 OPTIMA3." Our review was also informed by presentations at April 18, 2019, and August 21, 2019, Thermal-Hydraulic Subcommittee briefings. During these meetings, we had the benefit of discussions with Westinghouse and the staff. We also had the benefit of the referenced documents.

### **CONCLUSIONS AND RECOMMENDATION**

1. The D5 critical power (CP) correlation, when used in compliance with the four limitations imposed by the staff, is acceptable for application to SVEA-96 Optima3 fuel.
2. The safety evaluation should be issued.

### **DISCUSSION**

The D5 topical report documents a correlation to estimate the CP for SVEA-96 Optima3 fuel. Optima3 fuel introduces a few evolutionary changes to SVEA-96 Optima2 fuel. Spacer design is the main improvement that increases the margin to CP.

A series of tests were conducted in the FRIGG facility to develop a database for CP conditions for Optima3 fuel. Both steady state and transient data were collected and analyzed to generate the D5 correlation, which uses a different formulation than the approved D4.1 correlation. This new formulation results in a better fit to all the data by accounting more accurately for part-length rods, pin powers, and axial power shapes.

The staff has reviewed the topical report using the methodology described in NUREG/KM-0013, "Credibility Assessment Framework for Critical Boiling Transition Models." It provides a well-

structured and logical approach to the review of data-driven models. This approach provides consistency and completeness to this and future reviews. We were pleased to see that the staff considered the suggestion in our June 15, 2018, letter and published this methodology in a publicly available document. Future submittals will benefit from the predictability that this methodology provides by defining all the information expected in the submittal.

The staff has imposed four limitations on the use of this correlation. These limit the range of its applicability and ensure appropriate conservatisms in the unlikely event when bundles with high pin-power peaking become limiting.

In 2014, Optima2 fuel loaded in a foreign Boiling Water Reactor (BWR6) reactor showed signs of degradation in the form of V-shaped markings. The issue has been reviewed thoroughly by a multinational multi-disciplinary team, and the staff conclusion is that it does not affect the use of the D5 correlation for Optima3 fuel. Nevertheless, the staff imposed a limitation regarding the use of the D5 correlation in BWRs with lower plenum cross-beams as a defense-in-depth measure. We reviewed this issue in detail during an April 18, 2019, Subcommittee meeting and concur with the staff's evaluation.

## **SUMMARY**

The D5 correlation, when used in compliance with the four limitations imposed by the staff, is acceptable for application to SVEA-96 Optima3 fuel. The safety evaluation should be issued.

Sincerely

**/RA/**

Peter Riccardella  
Chairman

## REFERENCES

1. Bergmann, U., Hemlin, M., Bergman, K., and J-M. Le Core, Westinghouse Electric Company, "10x10 SVEA Fuel Critical Power Experiments and New CPR Correlation: D5 for SVEA-96 Optima3", WCAP-17794-P/NP, Revision 0, November 22, 2013 (ML13333A275 (Non-Proprietary Version/Publicly Available) and ML13333A276 (Proprietary Version/Non-Publicly Available)).
2. U.S. Nuclear Regulatory Commission, Safety Evaluation, "Draft Safety Evaluation for WCAP-17794-P, Revision 0, "10x10 SVEA Fuel Critical Power Experiments and New CPR Correlation: D5 for SVEA-96 Optima3", " Revision 0, July 17, 2019 (ML19171A281 (Proprietary Version/Non-Publicly Available)).
3. Advisory Committee of Reactor Safeguards, Letter Report, "Safety Evaluation of the NuScale Power, LLC Topical Report TR-0616-48793, Revision 0, "Nuclear Analysis Codes and Methods Qualification," and Safety Evaluation of the NuScale Power, LLC Topical Report TR-0116-21012, Revision 1, June 15, 2018 "NuScale Power Critical Heat Flux Correlations." " (ML18166A303 (Publicly Available))
4. U.S. Nuclear Regulatory Commission, NUREG/KM-0013, "Credibility Assessment Framework for Critical Boiling Transition Models-Generic Safety Case to Determine the Credibility of Critical Heat Flux and Critical Power Models – Draft Report for Comment," March 31, 2019 (ML19073A249 (Publicly Available))

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