

FINAL SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ADDENDUM 1 TO WCAP-16500, SUPPLEMENT 1, REVISION 1,

“APPLICATION OF CE SETPOINT METHODOLOGY FOR

CE 16X16 NEXT GENERATION FUEL (NGF)”

WESTINGHOUSE ELECTRIC COMPANY

PROJECT NO. 700

1.0 INTRODUCTION AND BACKGROUND

By letter dated March 9, 2010 (Reference 1), Westinghouse Electric Company Nuclear Services (Westinghouse) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review Addendum 1 to Topical Report (TR) WCAP-16500-P, Supplement 1, Revision 1, “Application of CE Setpoint Methodology for CE 16X16 Next Generation Fuel (NGF).” This TR incorporates a response to the previous request for additional information (RAI) and requests removal of an interim margin penalty imposed by the NRC staff on the Combustion Engineering (CE) setpoint methodology detailed in WCAP-16500-P, Supplement 1, Revision 1 TR (Reference 2).

2.0 REGULATORY EVALUATION

Regulatory guidance for the review of fuel system designs and adherence to applicable General Design Criteria (GDC) is provided in Section 4.2, “Fuel System Design” of NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants” (SRP 4.2) (Reference 3). In accordance with SRP 4.2, the objectives of the fuel system safety review are to provide assurance that:

- a. The fuel system is not damaged as a result of normal operation and anticipated operational occurrences (AOOs),
- b. Fuel system damage is never so severe as to prevent control rod insertion when it is required,
- c. The number of fuel rod failures is not underestimated for postulated accidents, and
- d. Coolability is always maintained.

ENCLOSURE

In addition to licensed reload methodologies, an approved mechanical design methodology is utilized to demonstrate compliance to SRP 4.2 fuel design criteria. The NRC staff's original review of WCAP-16500-P, Supplement 1, Revision 1, TR (Reference 4) was done to ensure that the approved reload and fuel mechanical design methodologies (1) remain applicable to the NGF design, and (2) adequately addresses the applicable regulatory requirements identified in SRP 4.2. In addition, based upon Lead Test Assemblies (LTAs), post-irradiation examinations (PIEs), mechanical testing, past operating experience of similar designs and materials, and fuel performance model predictions, the NRC staff reviewed expected performance of the CE16NGF assembly to ensure it satisfied these requirements.

WCAP-16500-P, Supplement 1, Revision 1, addressed deficiencies in the CE digital setpoint methodology identified during the NRC staff's original review of this TR. The NRC staff's review of TR found the revised digital setpoint methodology acceptable, but imposed an interim departure from nucleate boiling (DNB) penalty until Westinghouse provides an acceptable response to Request for Additional Information (RAI) #1 (Reference 2). This current review focuses on Westinghouse's supplemental response to RAI #1. Hence, the NRC staff's review is based on its prior reviews of the CE16NGF (Reference 4) and CE digital setpoint methodology (Reference 2).

3.0 TECHNICAL EVALUATION

During its review of WCAP-16500-P, Supplement 1, Revision 1, (Reference 2), the NRC staff found the revised CE digital setpoint methodology acceptable, but imposed an interim DNB penalty until Westinghouse provides an acceptable response to RAI #1. The condition in the NRC staff's safety evaluation for WCAP-16500-P, Supplement 1, Revision 1, states:

Licensees referencing WCAP-16500-P, Supplement 1, Revision 1, must ensure compliance with the following conditions and limitations:

Until Westinghouse provides an acceptable written response to RAI #1, an interim margin penalty of 3.0 percent must be applied to the final addressable constants (e.g., $BERR1 * 1.03$, $[(1+EPOL2)*1.03 - 1.0]$) calculated following the analytical steps defined in WCAP-16500-P, Supplement 1, Revision 1.

The NRC staff requested that Westinghouse modify COLSIM and CPCSIM algorithms and perform DNB thermal margin calculations to assess the overall conservatism of the revised digital setpoint methodology in RAI #1 (Reference 2). Westinghouse provided the results of the requested calculations at several different reload depletion steps and axial power distributions for two recent reload campaigns in Reference 1. Examination of the results of these calculations confirms that the digital setpoint process detailed in WCAP-16500-P, Supplement 1, Revision 1, is conservative. Based upon its review of the requested calculations, the NRC staff finds Westinghouse's response to RAI #1 acceptable. Therefore, the previously imposed 3.0 percent interim DNB penalty is no longer required.

4.0 LIMITATIONS AND CONDITIONS

No new conditions and limitations.

5.0 CONCLUSION

Based upon a review of the material presented in Addendum 1 to WCAP-16500-P, Supplement 1, Revision 1, the NRC staff finds that the CE digital setpoint process acceptable to reload cores containing CE16NGF assemblies. As such, prior interim DNB margin penalties (6.0 percent dictated via Condition #5 in WCAP-16500-P, Reference 4, and 3.0 percent dictated via WCAP-16500-P, Supplement 1, Revision 1, Reference 2) are no longer required. Licensees referencing this TR will need to comply with remaining conditions and limitations from WCAP-16500-P, Revision 0, (Reference 4).

6.0 REFERENCES

1. Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "Addendum 1 to WCAP-16500-P, Supplement 1, Revision 1, 'Application of CE Setpoint Methodology for CE 16x16 Next Generation Fuel (NGF) (Follow-up Response to NRC RAI #1)'," LTR-NRC-10-14, March 9, 2010. (ADAMS Accession No. ML100740384)
2. Letter from U.S. Nuclear Regulatory Commission to J. A. Gresham (W), "Final Safety Evaluation for Westinghouse Electric Company Topical Report WCAP-16500-P, Supplement 1, Revision 1, 'Application of CE Setpoint Methodology for CE 16x16 Next Generation Fuel (NGF)'," December 28, 2009. (ADAMS Accession No. ML093280716)
3. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 4.2, "Fuel System Design," U.S. NRC, March 2007.
4. Letter from U.S. Nuclear Regulatory Commission to J. A. Gresham (Westinghouse), "Final Safety Evaluation for Westinghouse Electric Company (Westinghouse) Topical Report (TR) WCAP-16500-P, Revision 0, 'CE [Combustion Engineering] 16X16 Next Generation Fuel [(NGF)] Core Reference Report'," July 30, 2007. (ADAMS Accession No. ML071920269)

Principle Contributor: Paul Clifford (NRR/DSS)

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