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8 DRAFT SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

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

11  
12 “APPLICATION OF CE SETPOINT METHODOLOGY FOR

13  
14 CE 16X16 NEXT GENERATION FUEL (NGF)”

15  
16 WESTINGHOUSE ELECTRIC COMPANY

17  
18 PROJECT NO. 700

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21 1.0 INTRODUCTION AND BACKGROUND

22  
23 By letter dated March 9, 2010 (Reference 1), Westinghouse Electric Company Nuclear Services  
24 (Westinghouse) submitted for U.S. Nuclear Regulatory Commission (NRC) staff review  
25 Addendum 1 to Topical Report (TR) WCAP-16500-P, Supplement 1, Revision 1, “Application of  
26 CE Setpoint Methodology for CE 16X16 Next Generation Fuel (NGF).” This TR incorporates a  
27 response to the previous request for additional information (RAI) and requests removal of an  
28 interim margin penalty imposed by the NRC staff on the Combustion Engineering (CE) setpoint  
29 methodology detailed in WCAP-16500-P, Supplement 1, Revision 1 TR (Reference 2).  
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32 2.0 REGULATORY EVALUATION

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34 Regulatory guidance for the review of fuel system designs and adherence to applicable General  
35 Design Criteria (GDC) is provided in Section 4.2, “Fuel System Design” of NUREG-0800,  
36 “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants”  
37 (SRP 4.2) (Reference 3). In accordance with SRP 4.2, the objectives of the fuel system safety  
38 review are to provide assurance that:  
39

- 40 a. The fuel system is not damaged as a result of normal operation and anticipated  
41 operational occurrences (AOOs),  
42  
43 b. Fuel system damage is never so severe as to prevent control rod insertion when it is  
44 required,  
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46 c. The number of fuel rod failures is not underestimated for postulated accidents, and  
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48 d. Coolability is always maintained.  
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50 ENCLOSURE  
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1 In addition to licensed reload methodologies, an approved mechanical design methodology is  
2 utilized to demonstrate compliance to SRP 4.2 fuel design criteria. The NRC staff's original  
3 review of WCAP-16500-P, Supplement 1, Revision 1, TR (Reference 4) was done to ensure  
4 that the approved reload and fuel mechanical design methodologies (1) remain applicable to the  
5 NGF design, and (2) adequately addresses the applicable regulatory requirements identified in  
6 SRP 4.2. In addition, based upon Lead Test Assemblies (LTAs), post-irradiation examinations  
7 (PIEs), mechanical testing, past operating experience of similar designs and materials, and fuel  
8 performance model predictions, the NRC staff reviewed expected performance of the CE16NGF  
9 assembly to ensure it satisfied these requirements.

10  
11 WCAP-16500-P, Supplement 1, Revision 1, addressed deficiencies in the CE digital setpoint  
12 methodology identified during the NRC staff's original review of this TR. The NRC staff's review  
13 of TR found the revised digital setpoint methodology acceptable, but imposed an interim  
14 departure from nucleate boiling (DNB) penalty until Westinghouse provides an acceptable  
15 response to Request for Additional Information (RAI) #1 (Reference 2). This current review  
16 focuses on Westinghouse's supplemental response to RAI #1. Hence, the NRC staff's review is  
17 based on its prior reviews of the CE16NGF (Reference 4) and CE digital setpoint methodology  
18 (Reference 2).

### 19 20 21 3.0 TECHNICAL EVALUATION

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

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

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

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

### 45 46 47 4.0 LIMITATIONS AND CONDITIONS

48  
49 No new conditions and limitations.

1 5.0 CONCLUSION

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3 Based upon a review of the material presented in Addendum 1 to WCAP-16500-P,  
4 Supplement 1, Revision 1, the NRC staff finds that the CE digital setpoint process acceptable to  
5 reload cores containing CE16NGF assemblies. As such, prior interim DNB margin penalties  
6 (6.0 percent dictated via Condition #5 in WCAP-16500-P, Reference 4, and 3.0 percent dictated  
7 via WCAP-16500-P, Supplement 1, Revision 1, Reference 2) are no longer required. Licensees  
8 referencing this TR will need to comply with remaining conditions and limitations from  
9 WCAP-16500-P, Revision 0, (Reference 4).

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12 6.0 REFERENCES

- 13  
14 1. Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission,  
15 "Addendum 1 to WCAP-16500-P, Supplement 1, Revision 1, 'Application of CE Setpoint  
16 Methodology for CE 16x16 Next Generation Fuel (NGF) (Follow-up Response to NRC  
17 RAI #1)'," LTR-NRC-10-14, March 9, 2010. (ADAMS Accession No. ML100740384)  
18  
19 2. Letter from U.S. Nuclear Regulatory Commission to J. A. Gresham (W), "Final Safety  
20 Evaluation for Westinghouse Electric Company Topical Report WCAP-16500-P,  
21 Supplement 1, Revision 1, 'Application of CE Setpoint Methodology for CE 16x16 Next  
22 Generation Fuel (NGF)'," December 28, 2009. (ADAMS Accession No. ML093280716)  
23  
24 3. NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for  
25 Nuclear Power Plants," Section 4.2, "Fuel System Design," U.S. NRC, March 2007.  
26  
27 4. Letter from U.S. Nuclear Regulatory Commission to J. A. Gresham (Westinghouse),  
28 "Final Safety Evaluation for Westinghouse Electric Company (Westinghouse) Topical  
29 Report (TR) WCAP-16500-P, Revision 0, 'CE [Combustion Engineering] 16X16 Next  
30 Generation Fuel [(NGF)] Core Reference Report'," July 30, 2007. (ADAMS Accession  
31 No. ML071920269)

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35 Date: