

April 14, 2003

Mr. Henry A. Sepp, Jr.  
Manager of Regulatory and Licensing Engineering  
Westinghouse Electric Company  
P.O. Box 355  
Pittsburgh, PA 15230-0355

SUBJECT: SAFETY EVALUATION OF ADDENDUM 1 TO TOPICAL REPORT (TR)  
WCAP-10125-P-A, "EXTENDED BURNUP EVALUATION OF WESTINGHOUSE  
FUEL" (TAC NO. MB7484)

Dear Mr. Sepp:

On December 5, 2002, Westinghouse Electric Company submitted Addendum 1 to TR WCAP-10125-P-A, "Extended Burnup Evaluation of Westinghouse Fuel," for NRC staff review and approval. WCAP-10125-P-A is an approved TR that describes analytical methodologies including the design bases, limits, and criteria for Westinghouse fuel in high burnup licensing applications.

The addendum proposes a revision to the fuel cladding stress criterion to be consistent with current industry guidelines. Specifically, it replaces the transient stress criterion of fuel rod analysis with a new cladding stress criterion based on the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section III requirements. The NRC staff has completed its review of the subject Addendum 1 to TR WCAP-10125-P-A. The addendum is acceptable for referencing in licensing applications to the extent specified and under the limitations delineated in the report and in the associated NRC safety evaluation (SE). The enclosed SE defines the basis for acceptance of the TR.

Pursuant to 10 CFR 2.790, we have determined that the enclosed SE does not contain proprietary information. However, we will delay placing the SE in the public document room for a period of ten working days from the date of this letter to provide you with the opportunity to comment on the proprietary aspects only. If you believe that any information in the enclosure is proprietary, please identify such information line by line and define the basis pursuant to the criteria of 10 CFR 2.790.

We do not intend to repeat our review of the matters described in the subject report and found acceptable, when the report appears as a reference in license applications, except to ensure that the material presented applies to the specific plant involved. Our acceptance applies only to matters approved in the report.

In accordance with the guidance provided on the NRC website, we request that Westinghouse publish an accepted version within three months of receipt of this letter. The accepted version shall incorporate (1) this letter and the enclosed SE between the title page and the abstract, (2) all requests for additional information from the staff and all associated responses, and (3) a "-A" (designating "accepted") following the report identification symbol.

H. Sepp

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Should our criteria or regulations change so that our conclusions as to the acceptability of the report are invalidated, Westinghouse and/or the applicants referencing the TR will be expected to revise and resubmit their respective documentation, or submit justification for the continued applicability of the TR without revision of their respective documentation.

Sincerely,

*/RA/*

Herbert N. Berkow, Director  
Project Directorate IV  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Project No. 700

Enclosure: Safety Evaluation

cc w/encl:  
Mr. Gordon Bischoff, Project Manager  
Westinghouse Owners Group  
Westinghouse Electric Company  
Mail Stop ECE 5-16  
P.O. Box 355  
Pittsburgh, PA 15230-0355

Mr. Henry A. Sepp, Jr.

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Mail Stop ECE 5-16  
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Pittsburgh, PA 15230-0355

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

TOPICAL REPORT WCAP-10125-P-A, ADDENDUM 1,

"EXTENDED BURNUP EVALUATION OF WESTINGHOUSE FUEL"

WESTINGHOUSE ELECTRIC COMPANY

PROJECT NO. 700

1.0 INTRODUCTION

On December 5, 2002, Westinghouse Electric Company submitted Addendum 1 to Topical Report (TR) WCAP-10125-P-A, "Extended Burnup Evaluation of Westinghouse Fuel," for NRC staff review and approval. WCAP-10125-P-A is an approved TR that describes analytical methodologies including the design bases, limits, and criteria for Westinghouse fuel in high burnup licensing applications. Addendum 1 proposes a revision to the fuel cladding stress criterion to be consistent with current industry guidelines.

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix A, General Design Criterion (GDC) 10 states, "The reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences." This review provides assurance that the requirements of GDC 10 are properly implemented in the proposal.

Fuel rods constantly experience thermal and mechanical loads during steady-state and transient reactor operating conditions. The cladding strain produced from those loads can be divided into two components: steady-state and transient strains. The total strain is the sum of the steady-state and transient strains. However, cladding stress is either steady-state stress or transient stress depending on the cladding loading conditions. To protect fuel rods against pellet-cladding interaction (PCI), which is a severe transient condition that could lead to multiple fuel failures, Standard Review Plan (SRP) Section 4.2 establishes two limiting criteria: (1) the total strain shall not exceed 1 percent, and (2) fuel melting should be avoided.

3.0 TECHNICAL EVALUATION

Westinghouse has established four design criteria to protect against PCI in WCAP-10125-P-A. These four criteria are: (1) transient strain must be less than 1 percent, (2) total strain must be less than 1 percent, (3) fuel centerline melting must not occur, and (4) transient stress must be less than a proprietary value. Westinghouse stated that the first three criteria meet the intent of the SRP recommendations, and the fourth criterion is redundant and does not represent current

industry guidelines. Westinghouse therefore proposed to replace the fourth criterion of transient stress with a cladding stress limit based on the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section III criteria.

SRP Section 4.2 indicates that stress limits are acceptable if they are obtained using methods based on the ASME Code, Section III criteria. Section III describes various stress state criteria and limits, and is widely accepted in the nuclear industry. The Westinghouse proposal for a fuel rod cladding stress limit based on the ASME Code, Section III is consistent with the SRP Section 4.2 recommendations. Based on the use of the acceptable ASME Code, Section III methods, the staff approves the Westinghouse proposal to revise the fuel rod cladding stress limit.

#### 4.0 CONCLUSION

The staff has reviewed Addendum 1 to WCAP-10125-P-A that would replace the transient stress criterion of fuel rod analysis with a new cladding stress criterion based on the ASME Code, Section III requirements. Because it is consistent with the SRP Section 4.2 and ASME Code, Section III requirements, the staff approves the proposed cladding stress criterion in Addendum 1 to WCAP-10125-P-A.

Principal Contributor: S. Wu

Date: April 14, 2003