

**REQUEST FOR ADDITIONAL INFORMATION
BY THE OFFICE OF NUCLEAR REACTOR REGULATION
WCAP-18483-P/NP, REVISION 0, “ENCORE® CHROMIUM COATED CLADDING FOR USE
IN PRESSURIZED WATER REACTORS”
WESTINGHOUSE ELECTRIC COMPANY
DOCKET NO. 99902038
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Background

By letter dated July 3, 2025 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML25184A399), Westinghouse Electric Company (Westinghouse), submitted topical report (TR) WCAP-18483-P/NP, Revision 0, “EnCore® Chromium Coated Cladding for Use in Pressurized Water Reactors” (Proprietary/Non-proprietary), for the U.S. Nuclear Regulatory Commission (NRC) review and approval. The NRC staff has reviewed TR WCAP-18483-P/NP, Revision 0, conducted the regulatory audit on December 11-12, 2025, and determined that additional information is required to complete the review.

Regulatory Basis

Regulatory guidance for the review of fuel system materials and designs and adherence to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix A, General Design Criteria (GDC)-10, “Reactor Design,” GDC-27, “Combined Reactivity Control Systems Capability,” GDC-28, “Reactivity Limits,” and GDC-35, “Emergency Core Cooling,” is provided in NUREG-0800, “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants” (SRP), Section 4.2, “Fuel System Design.” In accordance with SRP Section 4.2, the objectives of the fuel system safety review are to provide reasonable assurance that: (1) the fuel system is not damaged as a result of normal operation and anticipated operational occurrences (AOOs), (2) fuel system damage is never so severe as to prevent control rod insertion when it is required, (3) the number of fuel rod failures is not underestimated for postulated accidents, and (4) coolability is always maintained. A “not damaged” fuel system is defined as fuel rods that do not fail, fuel system dimensions that remain within operational tolerances, and functional capabilities that are not reduced below those assumed in the safety analysis. Objective 1, above all, is consistent with GDC-10, and the design limits that accomplish this are called specified acceptable fuel design limits. “Fuel rod failure” means that the fuel rod leaks, and that the first fission product barrier (the cladding) has therefore, been breached.

Regulatory requirements pertinent to loss-of-coolant accidents (LOCAs) include, but are not limited to 10 CFR 50.46, which specifies requirements pertaining to the performance of emergency core cooling systems during a postulated LOCA. The regulation at 10 CFR 50.46 requires evaluation models to demonstrate conformance to the acceptance criteria described in paragraph (b) for demonstrating adequate emergency core cooling system performance. These acceptance criteria include limits on peak cladding temperature, maximum local oxidation, core wide oxidation, and the requirement to maintain a coolable geometry.

Question 1

Section 5.3.1.5.2 of the TR WCAP-18483-P/NP, Revision 0, “EnCore® Chromium Coated Cladding for Use in Pressurized Water Reactors,” discusses [

]. However,

Section 5.3.1.6.2 of the TR discusses retention of the 17 percent Baker-Just (BJ) effective cladding reacted (ECR) integral time-at-temperature limit (or the equivalent 13 percent ECR calculated using the Cathcart-Pawel correlation). Please discuss how [] are used when determining the peak cladding temperature and maximum local oxidation.

Question 2

Section 5.3.2 of the TR states []

[]. Please justify how the LOCA peak cladding temperature and maximum local oxidation calculations remain conservative if []

Question 3

Section 5.1.7 of the TR states that [] and "... the EnCore fuel-specific FEA models should be used in stress analyses." Please explain (a) the differences in the seismic-LOCA and the stress analyses discussed in Section 5.1.7; and (b) why the stress analysis []

Question 4

Section 5.1.7 of the TR states that "Validation of the EnCore fuel assembly FEA [finite element analysis] models by comparison to the mechanical test data should be considered before using the FEA models or results for any plant/utility licensing documentation." Please provide more information about the validation plan for the FEA models.

Question 5

Section 5.2.1.2 of the TR states that the cladding hydrogen content will be calculated as []

[]. No basis was provided for the hydrogen pickup model. Please provide justification for this hydrogen pickup model.

Question 6

The Cr-coated Interim Staff Guidance (ISG), ATF-ISG-2020-01, "Supplemental Guidance Regarding the Chromium-Coated Zirconium Alloy Fuel Cladding Accident Tolerant Fuel Concept" (ML19343A121), states that "If it can be shown that the Cr coating has a beneficial or negligible impact on the uniform elongation relative to the reference Zr alloy cladding, then it could be reasonably argued that the current RIA[reactivity insertion accident] failure limits are applicable to Cr-coated Zr cladding." Therefore, in order to justify the use of []

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Question 7

Section 5.3.3 of the TR states that the non-LOCA [

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Question 8

During the regulatory audit conducted by the NRC staff, Westinghouse stated that there were some errors in the TR. The regulation at 10 CFR 50.9 states that information provided to the Commission by an applicant for a license or by a licensee or information required by statute or by the Commission's regulations, orders, or license conditions to be maintained by the applicant or the licensee shall be complete and accurate in all material respects. As such, please correct any typos/errors in the submittal.

*concurred via email

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