

U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
REGULATORY AUDIT PLAN FOR THE UPCOMING CLOSED REGULATORY AUDIT
OF THE TOPICAL REPORT WCAP-18869-P/NP, REVISION 0
“HIGH PERFORMANCE CLADDING FOR USE IN BOILING WATER REACTOR FUEL”
WESTINGHOUSE ELECTRIC COMPANY
DOCKET NO. 99902038
EPID L-2024-TOP-0007

1.0 BACKGROUND

By letter dated March 8, 2024 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML24072A267), Westinghouse Electric Company (Westinghouse) submitted Topical Report (TR) WCAP-18869-P/NP, “High Performance Cladding for Use in Boiling Water Reactor Fuel,” for U.S. Nuclear Regulatory Commission (NRC) review and approval.

The NRC staff has reviewed the submittal and determined that a regulatory audit of the information identified in Section 4.0, “Information Requests,” below would assist in the timely completion of the subject TR review process. The NRC staff is continuing to review other aspects of the TR submittal and may identify the need for additional audit subjects by separate correspondence.

2.0. REGULATORY AUDIT BASES

An audit was determined to be the most efficient approach toward a timely resolution of questions associated with this TR review, because the NRC staff will have an opportunity to minimize the potential requests for additional information (RAIs) and ensure no unnecessary burden will be imposed by requiring Westinghouse to address issues that are no longer necessary to make a safety determination. Upon completion of this audit, the NRC staff is expected to achieve the following:

1. Confirm information that supports statements made in the TR.
2. Determine whether the information included in the documents is necessary to be submitted to support a safety conclusion.

The audit information the NRC staff determines to be necessary to support the development of the NRC staff’s safety evaluation (SE) will be requested to be submitted on the docket.

Enclosure 1

² Division of Operating Licensees (DORL)/Licensing Projects Branch (LLPB)

The NRC staff also will conduct a two-day virtual audit to support technical discussions associated with the review and supporting audit information. The audit is planned to be conducted virtually on December 12-13, 2024.

7.0 SPECIAL REQUESTS

The NRC staff would like access to the documents listed above in Section 4.0 through the online portal. The following conditions associated with the online portal must be maintained throughout the duration of the audit to make sure that the NRC staff have access to the online portal:

- The online portal will be password-protected, and separate passwords will be assigned to the NRC staff conducting the audit.
- The online portal will be sufficiently secure to prevent the NRC staff from printing, saving, downloading, or collecting any information on the online portal.
- Conditions of use of the online portal will be displayed on the login screen and will require acknowledgement by each user.

Username and password information should be provided directly to the NRC staff. All other communications should be coordinated through the NRC project manager.

8.0 DELIVERABLES

The NRC team will develop an audit summary report to convey the results. The report will be placed in ADAMS within 90 days of the completion of the final audit session. The audit information the NRC staff determines to be necessary to support the development of the NRC staff's SE will be requested to be submitted on the docket.

APPENDIX: AUDIT QUESTIONS/TOPICS OF DISCUSSION

Please address/discuss the draft RAls from previous HiFi TR submittal, specifically where those questions are discussed in this TR.

- 1) Please provide any additional data that may have been collected since publication of the submitted TR for all lead test rod (LTR) post irradiation examination (PIE) programs for HiFi cladding.
- 2) What are the boiling water reactor (BWR) reactor coolant chemistry control programs currently in the U.S. that are not part of the Westinghouse LTR program? Of those programs not specifically tested, please justify why those programs are not expected to have a negative effect on the performance of HiFi cladding (cladding corrosion, hydrogen pickup, etc.).
- 3) What are the model's uncertainty of HiFi cladding predicted oxide thickness that justifies using []
- 4) Please provide detailed model and data analysis information to justify the use of []
- 5) The following are related to the impact of high-performance cladding response to loss-of-coolant accident and associated analyses:
 - a) Have Equivalent Cladding Reacted (ECR) tests been performed on high burnup HiFi cladding with hydrogen present and oxide on inside diameter? If so, please provide any and all ECR data collected on HiFi material and compare with Zircaloy-2. What ECR correlation will be used for HiFi cladding when analyzing ECCS performance (Baker-Just, Cathcart-Pawel, or other)?
 - b) Please provide the detailed data and analysis of iron impact on the $\alpha \rightarrow \alpha + \beta$ transformation temperature that justifies []
 - c) Please []

] Also, please describe how flow blockage is determined from predicted burst strains for HiFi cladding.
- 6) The NRC staff would like to discuss any planned future surveillance, including PIEs, for the use of high-performance cladding material in fuel rod and bundle design in reload applications. The NRC staff would like to hear any relevant details on the following elements on acceptable performance: visual, oxide thickness, hydrogen level, cladding creep down, fuel rod and water rod growth, channel growth, channel bow, and shadow corrosion.
- 7) What are the textures and second phase particle (SPP) size distributions for the different lead use assembly's cladding with HiFi?

- 8) What fabrication specifications will be applied to texture and SPPs for HiFi cladding in production and how does these compare to current generation Zr-2 specifications for the fuel rods?

Other than the material composition, [

] If yes, what are

they and what [

]

- 9) Section 4.2: please provide detailed data of fuel rod design criteria along with the evaluations of the use of HiFi cladding on the specific criteria, such as rod internal pressure, cladding stresses, cladding strain, etc.
- 10) Please confirm that all the performance acceptance criteria and material limits [] If any changes are noted, please identify those changes and highlight where in this TR they are justified.
- 11) What is the maximum end-of-life fuel rod and local burnup expected to be based on the current U.S. BWR operating fleet practices and potential future changes to operating fleet practices (e.g., implementation of methodologies to support higher burnups)?
- 12) The NRC staff has noticed that Westinghouse has asked for approval for up to [] With the sparse data at high burnups, please discuss the justification for the acceptance criterion and material performance up to []