

From: Wentzel, Michael
Sent: Thursday, February 4, 2021 1:24 PM
To: Taylor, Andrew Charles
Subject: Sequoyah Nuclear Plant, Units 1 and 2 - Corrected Audit Plan and Setup of Online Reference Portal (EPID L-2020-LLA-0216)
Attachments: Sequoyah Nuclear Plant, Units 1 and 2 - Plan for Audit of Information in Support of LAR to Transition to Westinghouse Fuel (L-2020-LLA-0216).pdf

Dear Mr. Taylor:

By application dated September 23, 2020 (Agencywide Documents Access and Management System Accession No. ML20267A617), the Tennessee Valley Authority (TVA; the licensee) submitted a license amendment request (LAR) for Sequoyah Nuclear Plant, Units 1 and 2. The proposed amendments would revise Technical Specifications (TS) to allow the use of Westinghouse RFA-2 fuel with Optimized ZIRLO™ cladding. Further, the proposed amendments would revise TS 5.6.3, "Core Operating Limits Report," to replace the loss-of-coolant accident analysis evaluation model references with the FULL SPECTRUM™ Loss-of-Coolant Accident Evaluation Model. Finally, the proposed amendments would revise the TSs to permit the use of 52 full-length control rods with no full-length control rod assembly in core location H-08. This plan is being re-sent to correct a typo in the start date for the audit.

To improve the efficiency of the U.S. Nuclear Regulatory Commission (NRC) staff's review, TVA's representatives and the NRC staff have discussed the use of an audit using an online reference portal that would allow the NRC staff limited, read-only access to the information identified in Section 4.0 of the attached audit plan. The NRC staff plans to conduct a desk audit to review the documentation provided on the portal. The online reference portal would allow the NRC staff to audit internal licensee information to confirm that the information support statements made in the license amendment request and to determine whether the information included in the documents is necessary to reach a safety conclusion on the application. The audit information the NRC staff determines to be necessary to support the development of the NRC staff's safety evaluation will be requested to be formally submitted on the docket. The audit may also include interactions (e.g. teleconferences or webinars) on a mutually agreeable schedule sufficient to understand or resolve issues associated with the information made available on the online reference portal.

Use of the online reference portal is acceptable, as long as the following conditions are met:

- The online reference portal will be password-protected and passwords will be assigned to those directly involved in the review on a need-to-know basis;
- The online reference portal will be sufficiently secure to prevent NRC staff from printing, saving, or downloading any documents; and
- Conditions of use of the online reference portal will be displayed on the login screen and will require concurrence by each user.

These conditions associated with the online reference portal must be maintained throughout the duration of the audit process.

The NRC staff would like to request that the portal be populated with the information identified in Section 4.0 of the attached audit plan. The NRC staff may request additional documents during the review, which will be transmitted to you via email.

If you have any questions, please contact me at (301) 415 6459 or michael.wentzel@nrc.gov.

Sincerely,

Michael J. Wentzel, Project Manager
Plant Licensing Branch II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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Options
Priority: Normal
Return Notification: No
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AUDIT PLAN
REGARDING LICENSE AMENDMENT REQUEST TO
TRANSITION TO WESTINGHOUSE FUEL
TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT, UNITS 1, AND 2
DOCKET NOS. 50-327 AND 50-328
EPID L-2020-LLA-0216

1.0 BACKGROUND

By application dated September 23, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20267A617), the Tennessee Valley Authority (TVA; the licensee) submitted a license amendment request (LAR) for Sequoyah Nuclear Plant, Units 1 and 2 (Sequoyah). The proposed amendments would revise Technical Specifications (TS) to allow the use of Westinghouse RFA-2 fuel with Optimized ZIRLO™ cladding. Further, the proposed amendments would revise TS 5.6.3, “Core Operating Limits Report,” to replace the loss-of-coolant accident analysis evaluation model references with the FULL SPECTRUM™ Loss-of-Coolant Accident (FSLOCA) Evaluation Model (FSLOCA EM). Finally, the proposed amendments would revise the TSs to permit the use of 52 full-length control rods with no full-length control rod assembly in core location H-08.

The U.S. Nuclear Regulatory commission (NRC) staff has reviewed the licensee’s submittal and determined that a regulatory audit of the information identified in the Information Request section below would assist in the timely completion of the subject LAR review process. The NRC staff is continuing to review other aspects of the licensee’s 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 LAR review, because the NRC staff will have an opportunity to minimize the potential for RAls and ensure no unnecessary burden will be imposed by requiring the licensee to address issues that are no longer necessary to make a safety determination. The NRC staff is requesting an initial set of internal licensee information to be audited by the staff using an online reference portal. Upon completion of this audit, the NRC staff is expected to achieve the following.

1. Confirm internal licensee information that supports statements made in the LAR.
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 will be requested to be submitted on the docket.

3.0 REGULATORY AUDIT SCOPE AND METHODOLOGY

The purpose of the remote audit is to gain a more detailed understanding of the information supporting the licensee's request to transition to Westinghouse fuel at Sequoyah.

The areas of focus for the regulatory audit are the information contained in the licensee's submittal, the enclosed audit information needs, and all associated and relevant supporting documentation (e.g., methodology, process information, calculations, etc.) identified below. The audit will be performed consistent with NRC Office of Nuclear Reactor Regulation Office Instruction LIC-111, Revision 1, "Regulatory Audits," dated October 31, 2019 (ADAMS Accession No. ML19226A274).

4.0 INFORMATION REQUESTS

Please make the following information available for the NRC staff to audit via an online reference portal:

1. Any calculations or documents that were used in the determination and acceptability of the 5 percent transition core penalty on Nuclear Enthalpy Rise Hot Channel Factor ($F_{\Delta H}^N$) which is used in the proposed license condition (i.e., 5 percent reduction from 1.7 to 1.61).
2. Any calculations or documents that were used in the determination of the 0.25 percent and 0.50 percent departure from nucleate boiling ratio (DNBR) penalties used in the proposed license condition.
3. The evaluation that was performed to show that rod cluster control assembly (RCCA) H-08 removal has a very small impact in core thimble bypass flow and remains bounded by the flow assumed in the safety analyses supporting the fuel transition.
4. Attachment 9 (Justification for Permanent Removal of Units 1 and 2 RCCA H-08) of the LAR discusses the flow restrictor, reactor vessel thermal sleeve, head adapter, flange, and guide funnel. Provide the drawings or sketches of these components for the NRC staff to understand the physical geometry of these components and the relation of these components to the control rod drive mechanism.

In addition, to support the NRC staff's understanding of the LAR and to help identify any additional information needed to support its review, the staff requests that the licensee be prepared to discuss the questions identified in the attachment.

5.0 AUDIT TEAM

Key licensee personnel involved in the development of the LAR should be made available for interactions on a mutually agreeable schedule to respond to any questions from the NRC staff.

Team Member	Division	Area of Responsibility
Michael Wentzel	NRR/DORL/LPLII-2	Project Management
Robert Beaton	NRR/DSS/SNSB	Technical Review
John Grasso	NRR/DSS/SNSB	Technical Review
Charley Peabody	NRR/DSS/SNSB	Technical Review
Shie-Jeng Peng	NRR/DSS/SNSB	Technical Review
Muhammad Razzaque	NRR/DSS/SNSB	Technical Review
Yuken Wong	NRR/DE/EMIB	Technical Review

6.0 LOGISTICS

The audit will be conducted from February 4, 2021 to March 12, 2021 through an online portal established by the licensee. The NRC staff and contractor's access to the online portal should be terminated on March 30, 2021.

The NRC staff requests to conduct remote meetings with TVA staff to discuss the attached audit questions at a mutually agreeable time to be determined after the start of the audit.

7.0 SPECIAL REQUESTS

The NRC staff would like access to the documents listed above in Section 4.0 through an online portal that allows the NRC staff and contractors to access documents via the internet. The following conditions associated with the online portal must be maintained throughout the duration that the NRC staff and contractors have access to the online portal:

- The online portal will be password-protected, and separate passwords will be assigned to the NRC staff and contractors who are participating in the audit.
- The online portal will be sufficiently secure to prevent the NRC staff and contractors 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 and contractors. The NRC project manager will provide TVA the names and contact information of the NRC staff and contractors who will be participating in the audit. 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 safety evaluation will be requested to be submitted on the docket.

AUDIT QUESTIONS

- 1) Provide justification that only one maximum local fuel pin centerline temperature limit and associated limit degraded rate is specified for a transition core that contains two different types of fuel pin, especially, the new limit and associated degraded rate is much higher (i.e. non-conservatively) than the deleted limits and associated limit degraded rates.
- 2) The NRC staff identified the following deviations in the proposed changes to TS 3.2.1:

Deviation 1: The proposed Required Action (RA) B.2.1 would state, "Limit allowable THERMAL POWER and AFD [axial flux difference] limits as specified in the COLR [Core Operating Limits Report]," which is different from the B.2.1 approved in WCAP-17661-P-A B.2.1 that states, "Limit THERMAL POWER to less than RATED THERMAL POWER and reduce AFD limits as specified in the COLR."

Deviation 2: The licensee proposed to add "after each $F_Q^w(z)$ determination" to the Completion Time for the proposed RAs B.2.1, B.2.2 and B.2.3.
 - a) Please address and provide justification for Deviation 1, as identified above.
 - b) The licensee referred to TSTF-241 in its justification for Deviation (ii); however, the basis referred to from TSTF-241 for this justification is only applicable to the repeating power reduction process required by RAs A.1, A.2 and A.3, which is not required for RAs B.2.1, B.2.2 and B.2.3. Please provide additional justification for the proposed deviation.
- 3) Page 39 of 63 of Enclosure 1 to the LAR states "The generic phrase 'core power distribution' is substituted for 'incore detector,' as this would allow the use of either a PDMS [power distribution monitoring system] or the movable incore detectors to compare the results of the incore and NIS [nuclear instrumentation system] excore measurements." The NRC staff requests the licensee to confirm that the Reactor Trip System Instrumentation setpoint parameters in TS Table 3.3.1-1 for Overtemperature ΔT and Overpower ΔT are independent of whether the PDMS or moveable incore detectors are used in Surveillance Requirements 3.3.1.3 and 3.3.1.6.
- 4) Page 47 of 63 of Enclosure 1 to the LAR states "It is therefore expected that there will be a transition core penalty levied against the Westinghouse fuel for bottom-skewed shapes, but not for double-humped or top-skewed shapes." Given that the proposed license condition does not address power shape, the NRC staff requests the licensee to confirm that the transition core penalty will be applied to all Westinghouse RFA-2 fuel (when mixed with Framatome fuel), regardless of the power shape. Further, clarify whether the penalty will be applied over the entire axial length.
- 5) Page 47 of 63 of Enclosure 1 to the LAR states "The WRB-1 correlation was used in the HTP [high thermal performance] transition core evaluation, although it is not directly licensed for use with the HTP fuel." Clarify why the WRB-1 correlation used for the transition core effect on the Framatome HTP fuel while the WRB-2M correlation was used for the Westinghouse RFA-2 fuel.

- 6) Page 48 of 63 of Enclosure 1 to the LAR states "...and a transition core PCT [peak cladding temperature] penalty of 23°F for Framatome HTP fuel resulting from a hydraulic mismatch during transition cycles to Westinghouse RFA-2 fuel)." Page 7 of 45 of Attachment 8 of Enclosure 1 to the LAR states "During transitional mixed core configurations with resident HTP fuel, the Westinghouse RFA-2 fuel will not be penalized due to its overall lower loss coefficients." Given that FSLOCA was performed assuming a full core of Westinghouse RFA-2 fuel, explain how the 23°F penalty is applied during the transition cores.
- 7) Page 48 of 63 of Enclosure 1 to the LAR states "Where necessary, transition core penalties or conservative operational limits are set for the RFA-2 vs. HTP fuel (e.g., a 5 percent $F_{\Delta H}^N$ reduction (from 1.70 to 1.61) will be applied to the Framatome HTP fuel during the transition core cycles..." Discuss the basis for the 5% reduction. Clarify whether the single case, as noted on page 48 of 63, was the only analysis done to assure the 5% was an appropriate value. Given that the 1.7 value will be located in the COLR and can be changed from cycle to cycle, justify why a fixed value of 1.61 is used in the proposed license condition. Given that FSLOCA is performed assuming a full core of Westinghouse fuel, identify the value used in that analysis.
- 8) On page 49 of 63 of Enclosure 1 to the LAR, the proposed license condition states, in part:
- RFA-2 fuel assemblies the DNBR limit shall be reduced by:
 - 0.25% for the WRB-2M critical heat flux correlation
 - 0.50% for the ABB-NV critical heat flux correlation

The NRC staff requests the licensee to clarify what is meant by "the DNBR limit shall be reduced by:" Does this mean that the DNBR safety limit (as specified in TS 2.1.1.1) of 1.14 is actually reduced, or does it mean the values computed by the correlations are reduced by 0.25% or 0.50% (depending on fuel type), and then compared to the limit? The NRC staff notes that these penalties are much smaller than those seen in WCAP-11837-P-A. Clarify whether this is because the RFA-2 and HTP fuels are similar.

- 9) Page 2 of 45 of Attachment 8 to the LAR discusses the Limitations and Conditions (L&Cs) for WCAP-9272-P-A which states, in part, "Since quantitative criteria are not available for determining when an accident re-evaluation rather than a reanalysis can be performed, justification for any reevaluation should be presented in individual Reload Safety Evaluation reports." The licensee's response states that the Reload Safety Evaluation process will be implemented, however, does not mention anything about providing any justification for any reevaluations.
- 10) On page 5 of 45 of Attachment 8 to the LAR, L&C 3 for WCAP-10444-P-A states "An irradiation demonstration program should be performed to provide early confirmation performance data for the VANTAGE 5 design." The licensee's response states that this is not applicable and that there are hundreds of reactor-years collective operating experience. Clarify whether an irradiation demonstration program has been performed.
- 11) The Safety Evaluation (SE) for WCAP-11837-P-A adopts portions of a separate Technical Evaluation Report (TER), which is included as an attachment to the SE, as its conclusion section. The conclusions section of the TER states "We further found that the underlying methodology should be applicable independent of fuel designs, provided

that a thorough parametric study be performed to determine that the set of core configurations and state points analyzed adequately identified the limiting core conditions using an approved DNB correlation for the fuel assembly with an approved code.” Clarify whether a thorough parametric study was performed.

- 12) Section 3.4.2 on page 6 of 37 of Attachment 9 to the LAR discusses the thermal hydraulic impacts of the removal of control rod H-08. After installation of the flow restrictor, clarify what was done to assure the flows remain as expected.
- 13) Attachment 10 to Enclosure 1 of the LAR provides the Sequoyah Safety Analysis UFSAR Impact summary for the Westinghouse RFA-2 fuel transition. Clarify when these changes will be made to the UFSAR. What other changes will be made to the UFSAR to address the fuel transition?
- 14) L&C 3 of the FSLOCA EM requires, in part, that for Region II, the containment pressure calculation will be executed in a manner consistent with the approved methodology (i.e., the COCO or LOTIC2 model will be based on appropriate plant-specific design parameters and conditions, and engineered safety features which can reduce pressure are modeled). This includes utilizing a plant-specific initial containment temperature. Page 4 of Enclosure 2 of the LAR states that a plant-specific initial containment temperature associated with normal full-power operating conditions was modeled to comply with the L&C. Explain how the plant-specific initial containment temperature that was modeled is expected to reduce the containment pressure, which is required by the L&C.
- 15) Page 13 of Enclosure 2 of the LAR states, the loss coefficient of the Westinghouse RFA-2 fuel is slightly lower than the Framatome HTP fuel, and thus the RFA-2 fuel would receive a flow benefit in the presence of the relatively flow starved HTP fuel. The LAR also states that, for large-break loss-of-coolant accident (LBLOCA) transients, conditions during blowdown and reflood can be affected by mixed core conditions arising from a hydraulic mismatch, and that the PCT increase for HTP fuel resulting from the hydraulic mismatch was estimated to be 23°F. Please clarify the following:
 - a) Given that the Sequoyah analysis with the FSLOCA EM was performed assuming a full core of RFA-2 fuel only (when the actual core is a mixed core of RFA-2 and HTP fuels), please confirm whether the 23°F PCT increase for HTP legacy fuel was accounted for in the limiting LBLOCA PCT results for the mixed core shown in Table 4 of Enclosure 2 of the LAR.
 - b) Clarify in which fuel type (RFA-2 or HTP) the limiting LBLOCA PCT for the mixed core is expected to occur and why.
- 16) Page 13 of Enclosure 2 of the LAR states that, for SBLOCA transients, core-wide collapsed liquid levels correspond closely to a one-dimensional flow pattern, and the effects of grid loss coefficient differences among the assemblies are not significant in determining the PCT. As such, the existing analysis of record supporting operation with Framatome HTP fuel is applicable for the Framatome HTP fuel during the transition cycle(s) to Westinghouse RFA-2 fuel. In light of the preceding statements, clarify in which fuel type (RFA-2 or HTP) the limiting SBLOCA PCT for the mixed core, as shown in Table 4 of Enclosure 2 of the LAR, is expected to occur and why.