From:	Wentzel, Michael
Sent:	Monday, April 5, 2021 8:06 AM
To:	Taylor, Andrew Charles
Subject:	Sequoyah Nuclear Plant, Units 1 and 2 - Request for Additional Information Regarding Request to Transition to Westinghouse Fuel (EPID L-2020-LLA-0216)
Attachments:	Sequoyah Nuclear Plant, Units 1 and 2 - Request for Information Regarding LAR to Transition to Westinghouse Fuel (L-2020-LLA-0216).pdf

Dear Mr. Taylor:

By letter dated September 23, 2020 (Agencywide Documents Access and Management System Accession No. ML20267A617), the Tennessee Valley Authority submitted a license amendment request for Sequoyah Nuclear Plant, Units 1 and 2. The proposed amendments would allow for the would allow transition to Westinghouse Robust Fuel Assembly-2 fuel with Optimized ZIRLO^{TM} cladding.

The U.S. Nuclear Regulatory Commission's (NRC's) Nuclear Systems Performance Branch (SNSB) staff is reviewing the application and has identified areas where they need additional information to support their review. The NRC staff's request for additional information is attached. The NRC staff requests your response to this RAI within 30 days from the date of this email (i.e., by May 5, 2021).

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

Sincerely,

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

Hearing Identifier: NRR_DRMA
Email Number: 1105

Mail Envelope Properties (BLAPR09MB7267CFDD3F6790604C108394E7779)

Subject: Sequoyah Nuclear Plant, Units 1 and 2 - Request for Additional Information Regarding Request to Transition to Westinghouse Fuel (EPID L-2020-LLA-0216)
Sent Date: 4/5/2021 8:05:40 AM
Received Date: 4/5/2021 8:05:40 AM
From: Wentzel, Michael

Created By: Michael.Wentzel@nrc.gov

Recipients:
"Taylor, Andrew Charles" <actaylor@tva.gov>
Tracking Status: None

Post Office: BLAPR09MB7267.namprd09.prod.outlook.com

Files	**Size**	**Date & Time**
MESSAGE	1081	4/5/2021 8:05:40 AM
Sequoyah Nuclear Plant, Units 1 and 2 - Request for Information Regarding LAR to Transition to Westinghouse Fuel (L-2020-LLA-0216).pdf	110717	

Options
Priority: Normal
Return Notification: No
Reply Requested: No
Sensitivity: Normal
Expiration Date:

REQUEST FOR ADDITIONAL INFORMATION REGARDING

TO TRANSITION TO WESTINGHOUSE FUEL

TENNESSEE VALLEY AUTHORITY

SEQUOYAH NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-327 and 50-328

By application dated September 23, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20267A617), the Tennessee Valley Authority (TVA or the licensee) submitted a license amendment request (LAR) to revise the Technical Specifications for Sequoyah Nuclear Plant, Units 1 and 2 (Sequoyah). The proposed amendments would allow transition to Westinghouse Robust Fuel Assembly-2 (RFA-2) fuel with Optimized ZIRLO™ cladding at Sequoyah. 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 is reviewing the LAR and has identified where additional information is needed to complete its review. The NRC staff's request for additional information (RAI) is below.

REGULATORY BASIS

The regulatory basis for RAI-1 through RAI-8 is General Design Criterion (GDC) 10, "Reactor design." GDC 10 states that, "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."

The regulatory basis for RAI-9 through RAI-11 is Section 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," of Title 10 of the *Code of Federal Regulations*. Section 50.46 of 10 CFR, in part, establishes standards for the calculation of emergency core cooling system (ECCS) accident performance and acceptance criteria for that calculated performance.

NRC STAFF REQUESTS

RAI-1

TVA plans to transition Sequoyah Units 1 and 2 from Framatome-supplied High Thermal Performance (HTP) fuel to Westinghouse 17x17 RFA-2, commencing with Unit 1 Cycle 26 and Unit 2 Cycle 26. The licensee developed two transition core designs in addition to two equilibrium cycles as representative core designs to move Sequoyah from Framatome HTP fuel to Westinghouse RFA-2 fuel. The transition cycles contain both Framatome HTP and Westinghouse RFA-2 fuel.

For the proposed changes to TS 2.1.1, “Reactor Core SLs [Safety Limits],” the licensee has proposed a single departure from nucleate boiling ratio (DNBR) and single maximum local fuel pin centerline temperature.

a) The NRC staff requests the licensee provide justification that only one DNBR limit and correlation is applicable for a transition core that contains two different types of fuel.

b) The NRC staff requests the licensee 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. The justification should address the fact that the new limit and associated degraded rate is much higher (i.e. non-conservatively) than the current limits and associated limit degraded rates.

RAI-2

The NRC staff identified the following two deviations in the proposed changes to TS 3.2.1, “Heat Flux Hot Channel Factor ($F_Q(X,Y,Z)$)”:

Deviation 1: The new Required Action (RA) B.2.1 proposed in SQN as “Limit allowable THERMAL POWER and AFD limits as specified in the [Core Operating Limits Report] COLR” which is different from the B.2.1 approved in WCAP-17661-P-A B.2.1 as “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 new B.2.1, B.2.2 and B.2.3.

(a) The NRC staff requests the licensee address and provide a justification for Deviation 1, as identified above.

(b) The licensee referred to TSTF-241 in its justification for Deviation 2; 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. Therefore, the NRC staff requests the licensee provide additional justification for the proposed deviation.

RAI-3

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 HTP fuel, regardless of the power shape and applied to all analyses. Further, clarify whether the penalty is applied over the entire axial length of the fuel rod.

RAI-4

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 $F^N_{\Delta H}$ reduction (from 1.70 to 1.61) will be applied to the Framatome HTP fuel during the transition

core cycles…" The NRC staff requests the licensee clarify whether the single case, as discussed on page 48 of 63, was the only analysis done to assure the 5 perfect reduction is an appropriate value. In addition, given that the 1.7 value will be located in the COLR and is subject to change from cycle to cycle, justify why a fixed value of 1.61 is acceptable for use in the proposed license condition.

RAI-5

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 correlation used), and then compared to the limit? In addition, the NRC staff requests the licensee provide an example of how these penalties are applied.

RAI-6

The proposed license condition has DNBR penalties for the WRB-2M and ABB-NV correlations. However, as stated on page 27 of 63 of Enclosure 1 to the LAR, "When any of the conditions are outside the range of the WRB-2M DNB correlation, the W-3 and W-3 Alternative (ABB-NV and WLOP) DNB correlations and a deterministic treatment of key DNBR analysis uncertainties is used." The NRC staff requests the licensee to explain why there is no penalty applied to the WLOP correlation.

RAI-7

On page 8 of 63 of Enclosure 1 to the LAR, it states "The LOCA analysis considered two different pipe break situations: accumulator (ACC) line break and pressurizer (PZR) surge line break." The staff requests the licensee explain why these breaks were chosen as other breaks were examined in WCAP-9401-P-A that may be more limiting.

RAI-8

Page 45 of 63 of Enclosure 1 to the LAR states "While the Framatome HTP fuel remains within compliance with the Framatome methodologies listed in the current TS 5.6.3, these Framatome methods no longer establish core operating limits or PCT [peak cladding temperature] during a LOCA and have been removed." However, this appears inconsistent with page 8 of 45 of Attachment 8 to the LAR which states "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." The NRC staff requests the licensee to clarify if the Framatome methods establish the PCT during a LOCA and address if any other results from the Framatome methods are limiting for the two transition cores.

RAI-9

Limitation and Condition #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 46 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 Limitation and Condition. The NRC staff requests the licensee explain how the plant-specific initial containment temperature that was modeled is expected to reduce the containment pressure, which is required by the Limitation and Condition.

RAI-10

Page 13 of 46 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. Staff requests the licensee 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 for the two transition cycles is a mixed core of RFA-2 and HTP fuels), and the 23°F PCT penalty is applicable only to HTP fuel, the NRC staff requests the licensee to explain how the 23°F penalty is applied during the transition cores.

b) The NRC staff requests the licensee confirm whether the 23°F PCT increase for HTP legacy fuel is accounted for in the limiting LBLOCA PCT results for the mixed core shown in Table 4 of Enclosure 2 of the LAR.

c) The NRC staff requests the licensee clarify which fuel type (RFA-2 or HTP) would result in the limiting LBLOCA PCT for the transition cores. How is this determination made given that the analyses are done with a full core or each fuel type?

RAI-11

Page 13 of 46 of Enclosure 2 of the LAR states that, for small-break loss-of-coolant accident (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, the NRC staff requests the licensee clarify which fuel type (RFA-2 or HTP) has 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.