Sequoyah Nuclear Plant

Pre-Submittal Meeting for License Amendment Request to Eliminate the High Negative Flux Rate Trip

September 15, 2021

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Agenda

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- Description of the License Amendment
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Introduction

- The purpose of this meeting is to brief the Nuclear Regulatory Commission (NRC) regarding a TVA license amendment request for Sequoyah (SQN) to delete the requirement for the power range neutron flux rate-high negative rate trip (NFRT) function.
- This function is specified in Technical Specification (TS) Table 3.3.1-1, "Reactor Trip System Instrumentation."
- NRC approval is requested one year from submittal of the license amendment request.

Background

- The proposed change will delete the requirement for the NFRT function from TS Table 3.3.1-1, "Reactor Trip System Instrumentation."
- These changes are consistent with the NRC-approved methodology presented in Westinghouse Topical Report, WCAP-11394-P-A, "Methodology for the Analysis of the Dropped Rod Event," dated January 1990.
- TVA is adopting this methodology as part of the SQN transition from Framatome to Westinghouse fuel.

Description - Reason for Request

- The proposed change will eliminate an unnecessary trip function. This avoids unnecessary automatic reactor trips in response to control rod drop events.
- There have been 3 reactor trips on SQN Unit 1 since 2015 due to a dropped control rod that caused the NFRT to actuate.
  Licensee Event Reports 2021-001-00, 2019-003-01 and 2015-001-01 document these reactor trips.
  It is possible that the reactor trips might have been avoided if the NFRT function was not operating. This would have avoided an unnecessary reactor transient.

Description - Proposed TS – Units 1 and 2

SQN Units 1 and 2 Table 3.3.1-1, Reactor Trip System Instrumentation

FUNCTION	*APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS*	*REQUIRED CHANNELS*	*CONDITIONS*	*SURVEILANCE REQUIREMENTS*	*ALLOWABLE VALUE*	*NOMINAL TRIP SETPOINT*
3.Power Range Neutron Flux Rate						
~~a.~~ High Positive Rate	*1,2*	*4*	*E*	*SR 3.3.1.7 [(b)(c)] SR 3.3.1.11[(b)(c)]*	*<6.3% RTP with time constraint ≥ 2 sec*	*5% RTP with time constraint ≥ 2 sec*
~~b. High Negative Rate~~	*~~1,2~~*	*~~4~~*	*~~E~~*	*~~SR 3.3.1.7[(b)(c)] SR 3.3.1.11[(b)(c)] SR 3.3.1.14~~*	*~~< 6.3% RTP with time constraint ≥ 2 sec~~*	*~~5% RTP with time constraint ≥ 2 sec~~*

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Description - NFRT and WCAP-11394-P-A

- The original design basis for the NFRT was specifically to mitigate the consequences of one or more dropped rod cluster control assemblies (RCCAs).
- Safety analyses ensured the fuel departure from nucleate boiling (DNB) design basis was met for dropped rod(s) below the worth that would incur a NFRT.
- WCAP-11394-P-A expanded the analysis to the full range of dropped rod worths, providing a method via which no trip or automatic power reduction was required to meet the DNB design basis.
- The NRC Safety Evaluation Report for WCAP-11394-P-A concluded that the analysis contained an acceptable methodology for analyzing the dropped RCCA event for which no credit is taken for the NFRT.

Description - SQN Conformance with WCAP-11394-P-A

- The proposed changes to the SQN TS are based on analyses performed using the NRC approved methodology presented in WCAP-11394-P-A. This methodology assumes no direct reactor trip or automatic power reduction to mitigate the consequences of the dropped RCCA(s).
- The dropped RCCA analyses were performed as part of the transition from Framatome fuel to Westinghouse RFA-2 fuel.
- The key reload-related analysis assumptions, and confirmation that the DNB ratio (DNBR) design basis is met, are part of the reload safety analysis for each reactor core reload.
- No other safety analyses are impacted by this change, since no other safety analyses credit the NFRT.

Status of Fuel Transition

- The dropped RCCA analyses were performed as part of the transition from Framatome fuel to Westinghouse robust fuel assembly (RFA-2) fuel.
  Information concerning this transition and the related analyses was presented to the NRC in a letter from TVA to NRC, dated September 23, 2020, *Application to Modify the Sequoyah Nuclear Plant Units 1 and 2 Technical Specification to Allow for Transition to Westinghouse RFA-2 Fuel* [ML20267A617]
- NRC review of this fuel transition and the use of related analyses methodologies is on track for approval in the next few weeks.
- The WCAP-11394-P-A methodology will become part of the analysis of record for dropped RCCAs with the installation of the first Westinghouse RFA-2 fuel assemblies in the reactor cores, currently scheduled for October 2022 for SQN Unit 1 and March 2023 for SQN Unit 2.

TS Criteria

The NFRT function does not meet any of the four criteria of 10 CFR 50.36(c)(2)(ii), as outlined in the response for each criterion given below.

- Criterion 1: Installed instrumentation that is used to detect, and indicate in the control room, a significant abnormal degradation of the reactor coolant pressure boundary.
  - Discussion: The NFRT is not used for detection and indication in the control room of any degradation of the reactor coolant pressure boundary.

- Criterion 2: A process variable, design feature, or operating restriction that is an initial condition of a design basis accident or transient analysis that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.
  - Discussion: The NFRT is not an initial condition of a design basis accident or transient analysis.

TS Criteria (continued)

- Criterion 3: A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.
  - Discussion: No credit will be taken for the NFRT in the SQN accident analysis. The NFRT is not considered as part of the primary success path related to the integrity of a fission product barrier.

- Criterion 4: A structure, system, or component which operating experience or probabilistic risk assessment has shown to be significant to public health and safety.
  - Discussion: The High Negative Flux Rate is not relied upon as a signal to initiate a reactor trip for any events modeled in the scope of the Probabilistic Risk Assessment model. The NFRT function is not significant to public health and safety in that no credit was taken for this trip in any accident analysis.

Precedent

- Southern Nuclear submitted a license amendment request for Farley Nuclear Plant to remove the NFRT function from their TS
  (Letter from Southern Nuclear Operating Company to NRC, *Request to Revise Technical Specifications to Delete Reactor Trip System, Function 3b, Power Range Neutron Flux-High Negative Rate*, dated September 27, 2005 [ML052720582]).
- The NRC approved that request in a letter from the NRC to Southern Nuclear Operating Company, *Issuance of Amendments*, dated February 27, 2006 [ML053190381].
- The scope of that precedent is the same as the scope of this request.

Conclusion

- TVA will use the NRC-approved methodology in WCAP-11394-P-A for each SQN fuel cycle to ensure the minimum DNBR is maintained above the DNBR safety limit.
- The NFRT function will not be credited in the cycle-specific dropped RCCA analysis, the analysis will conform to WCAP-11394-P-A, and SQN will continue to meet the applicable DNBR limits.
- The regulatory requirements for TS are met without the inclusion of the NFRT function in the SQN TS.

Schedule Milestones

- September 15, 2021 – Pre-submittal meeting with NRC
- October 2021 – expected NRC approval of the SQN fuel transition license amendment – supports the use of WCAP-11394-P-A at SQN
- October 2021 – TVA submittal of the NFRT elimination license amendment request – <u>after</u> approval of the SQN fuel transition license amendment
- October 2022 – requested NRC approval date – one year following submittal

Closing Remarks

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