



Sequoyah Nuclear Plant Unit 1 TS 4.2.2 “Control Rod Assemblies” Exigent LAR

Pre-Submittal Conference Call
November 15, 2019

Objectives

- Provide a description of the SQN Unit 1 H-08 Control Rod issue
- Provide overview of planned implementation actions
- Provide overview of expected License Amendment Request (LAR) content
- Discuss planned submittal date and need date
- Answer NRC questions

Background

- Sequoyah Units 1 & 2 are Westinghouse 4-loop 3455MWt ice condenser plant designs
 - Framatome HTP 17x17 fuel
 - 193 Fuel assemblies, 53 control rods
- Unit 1 is currently shut down for the U1R23 refueling outage

Background - H-08

- On August 27, 2019 SQN Unit 1 center control rod (core location H-8) dropped into the core while the reactor was at 100% power causing an automatic scram of the unit.
- Troubleshooting completed at the time investigated the electronic control system and no deficiencies were identified.
 - The site initiated a root cause analysis which was indeterminate pending additional inspections during the fall refueling outage.
- The reactor was returned to 100% power and a second set of “grippers” was used to assist the normal grippers in holding the H-8 rod in position. There were no issues for the remainder of the cycle.

Background - H-08 Troubleshooting

- During the refueling outage, remote inspections of the inside of the control rod drive mechanism were performed using robotic cameras and action was taken to replace the H-08 jack shaft.
- The inspections performed identified excessive wear on the faces of the stationary grippers along with wear marks along the interior walls of the control rod drive mechanism.
- Throughout the process, the OEM has been reviewing inspection data as well as third party reviews.
- During pre-startup testing the H-8 rod dropped into the reactor multiple times at various positions both above and below the normal operating position. The degradation in operating characteristics of the H-8 control rod was not anticipated.

Background - Control Rod Configuration

	R	P	N	M	L	K	J	H	G	F	E	D	C	B	A
1															
2				SA		B		C		B					
3					SD		SB		SB		SC				
4				D				D				D		SA	
5			SC		SA						SA		SD		
6		B				C		A		C				B	
7			SB										SB		
8		C		D		A		D		A		D		C	
9			SB										SB		
10		B				C		A		C				B	
11			SD		SA						SA		SC		
12		SA		D				D				D			
13					SC		SB		SB		SD				
14						B		C		B		SA			
15															

Control Bank	Number of Rods	Shutdown Bank	Number of Rods
A	4	SA	8
B	8	SB	8
C	8	SC	4
D	9	SD	4

- Total of 53 Rod Control Cluster Assemblies (RCCA)
- RCCAs are grouped into Banks:
 - Four Shutdown Banks
 - Four Control banks
- Rod H-08 is part of Control Bank D and located in the center of the core

Background - H-08 Repairs

- Replacement of the Control Rod Drive Mechanism (CRDM) grippers is a long lead activity with first-of-a-kind elements (custom tooling, processes, crew qual. on mockups, etc.)
- Temporary modifications to utilize the H-08 movable gripper to hold the rod withdrawn were investigated but were not viable.
- Design change package being prepared for physical removal of the H-08 rod for the upcoming cycle.

Plant Changes Required

- Remove RCCA and associated drive shaft at core location H-08
- Install control rod guide tube flow restrictor on the upper internals
- Remove H-08 inputs to Rod Position Indication (RPI) system
- Remove power fuses for H-08 CRDM from the Rod Control system
- Revise Reload Safety Evaluation to include impact of control rod removal on nuclear design and safety analyses
- Revise affected procedures and design documents

Planned LAR Content

- Evaluated Rod H-08 removal impacts on:
 - Shutdown Margin
 - Boron Concentration and Boron Worth
 - Moderator Temperature Coefficient
- UFSAR Chapter 15 parameters were analyzed using the NRC-approved methods described in TS 5.6.3 and showed that limits assumed in safety analysis remain bounded.
- The Reload Safety Evaluation for the removal of H-08 validated all cycle-specific Reload Design Safety Analysis Review Checklist limits.

Overview of Proposed Change

- Requesting proposed amendment to allow Unit 1 to operate with 52 full-length control rod assemblies for one cycle
- No methodology changes
- Proposed change to TS 4.2.2 (change bar on right):

4.2.2 Control Rod Assemblies

NOTE

Operation with 52 full length control rod assemblies (with no control rod assembly installed in core location H-08) is permitted during Cycle 24.

The reactor core shall contain 53 full length and no part length control rod assemblies. The full length control rod assemblies shall contain a nominal 142 inches of absorber material. The nominal values of absorber material shall be 80 percent silver, 15 percent indium, and 5 percent cadmium. All control rods shall be clad with stainless steel tubing.

Planned LAR Content

- Current COLR limits remain unchanged.
- No new operator actions are expected.
- No impact on the functionality, structural integrity, or thermal hydraulic configuration of the reactor vessel upper internals
 - Flow restrictor installed in place of the control rod drive shaft

Precedence LAR

- South Texas Project – Emergency LAR to Revise TS 5.3.2 to Allow Operation with 56 Full-Length Rod Assemblies for Unit 1 Cycle 20 (LAR -12/3/15, SE 12/11/15)
- Duke (McGuire) – Exigent LAR to Revise TS 4.2.2 “Control Rod Assemblies” (LAR – 9/7/18, Withdrawn 9/28/18)
 - LAR was to remove Rod H-08 from the core.
 - LAR was submitted as a contingency if a repair to a thermal sleeve could not be performed. Repairs were successful

Differences between SQN 1 and Precedence

SQN Exigent LAR	McGuire	STP
Not a contingency	Contingency	Not a contingency
TS 4.2.2 note in accordance with ITS format	TS 4.2.2 footnote	TS 4.2.2. footnote
Framatome analysis	In-house analysis	Westinghouse analysis
No thimble plug	Thimble plug	Thimble plug
Control bank RCCA	Control bank RCCA	Shutdown bank RCCA

Proposed Schedule for Submittal and Requested Approval

- Sequoyah plans to submit the exigent LAR on November 16
- Plant is currently progressing to Mode 6 to perform initial field work
- Plant is remaining in Mode 6 pending approval and implementation of the design change
- Request NRC review 7 days after submittal

Closing and Questions