Southern Nuclear

Farley & Vogtle Pre-Submittal Meeting
Revise Technical Specification 3.2.1 Heat Flux Hot Channel Factor ($F_Q(Z)$)

March 2021

Meeting Purpose and Agenda

- The purpose for this meeting is to discuss a proposed amendment request to revise Technical Specification 3.2.1 Heat Flux Hot Channel Factor (FQ(Z)) to adopt WCAP-17661-P-A
- This meeting will cover the following topics:
  - Background on TS 3.2.1 and WCAP-17661
  - Proposed License Amendment Request

Background

Background

- Feb 1994 – WCAP-10216-P-A, Rev 1A, “Relaxation of Constant Axial Offset Control (and) FQ Surveillance Technical Specification” issued
- Feb 2009 – Westinghouse identified a non-conservatism associated with TS 3.2.1, Hot Flux Channel Factor (FQ(Z)), Required Action B
- Sep 2009 – Westinghouse issued NSAL 09-05, Revision 1
- Stations treated as non-conservative Technical Specification
- Jan 2014 – PWROG submitted TR WCAP-17661-P, Revision 1, in order to develop a solution to the problem identified in NSAL 09-05

Background

- Farley and Vogtle 1&2 identified a non-conservatism associated with TS 3.2.1 SR 3.2.1.2
- Feb 2015 – Westinghouse issued NSAL-15-1 after determining that one aspect of TS SR 3.2.1.2 may not be sufficient to assure that the peaking factor that is assumed in the licensing basis analysis is maintained under all conditions between the frequency of performance of TS SR 3.2.1.2.
  - Treated as non-conservative Technical Specification
  - NSAL-15-1 guidance is no longer required once the WCAP-17661-P based Tech Specs are implemented.
- Nov 2018 – NRC issues Safety Evaluation (SE) for WCAP-17661, Revision 1
- Aug 2019 – NRC issues verification letter noting WCAP-17661-N-P is acceptable for referencing in licensing applications (with limitations)

Background

- NSAL-09-5 entered into Corrective Action Program (CAP)
- NSAL-15-1 entered into CAP
- Corrective actions remain open pending approval of the amendment

- LAR Approach
  - As noted above, SNC will request adoption of WCAP-17661-P-A with limitations specified in the NRC SE dated November 23, 2018
  - TSTF-99-A, Extend LCO 3.2.1B, Required Action B.1 Completion Time from 2 hours to 4 hours
  - TSTF-241-A, Allow time for stabilization after reducing power due to QPTR out of limit
  - TSTF-290-A, Revisions to hot channel factor specifications

Proposed License Amendment Request

Proposed License Amendment Request

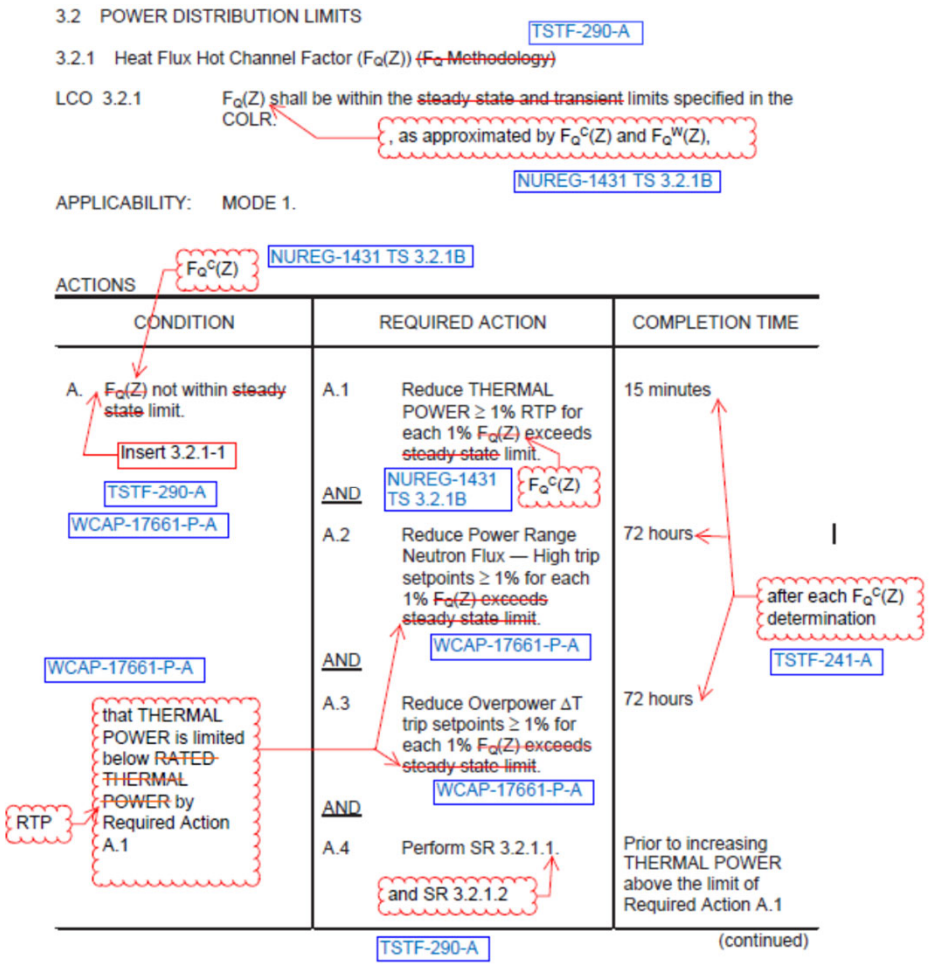
Resolve the non-conservative TS issues identified in NSAL-09-05, Revision 1, and NSAL-15-1 by submitting a LAR to:

- Implement TS 3.2.1 surveillance formulations and required actions as shown in WCAP-17661-P-A, Revision 1
  - Apply Approval Limitations in the associated NRC SE.
    - Limitation 1: Use of A_{XY} and A_Q
    - Limitation 2: Power Level Reduction to 50% RTP
- Implement TSTF-99-A, TSTF-241-A, and TSTF-290-A

Technical Specification

- Proposed TS Changes
  - TS 3.2.1 Condition A
  - TS 3.2.1 Condition B
  - SR 3.2.1.1 and SR 3.2.1.2
  - TS 5.6.5
- Schedule Milestones
  - Submit March 2021
  - Approval Requested by March 2022
  - Implement after next refueling outage for each unit

Proposed TS Markups



3.2 POWER DISTRIBUTION LIMITS

TSTF-290-A

3.2.1 Heat Flux Hot Channel Factor ($F_Q(Z)$) ~~(F_Q Methodology)~~

LCO 3.2.1 $F_Q(Z)$ shall be within the ~~steady state and transient~~ limits specified in the COLR.

, as approximated by $F_Q^C(Z)$ and $F_Q^W(Z)$,

NUREG-1431 TS 3.2.1B

APPLICABILITY: MODE 1.

NUREG-1431 TS 3.2.1B

$F_Q^C(Z)$

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. ~~$F_Q(Z)$~~ not within ~~steady state~~ limit. Insert 3.2.1-1 TSTF-290-A WCAP-17661-P-A	A.1 Reduce THERMAL POWER ≥ 1% RTP for each 1% ~~$F_Q(Z)$~~ exceeds ~~steady state~~ limit. NUREG-1431 TS 3.2.1B $F_Q^C(Z)$	15 minutes
	AND A.2 Reduce Power Range Neutron Flux — High trip setpoints ≥ 1% for each 1% ~~$F_Q(Z)$ exceeds steady state limit.~~ WCAP-17661-P-A	72 hours after each $F_Q^C(Z)$ determination TSTF-241-A
WCAP-17661-P-A RTP that THERMAL POWER is limited below ~~RATED THERMAL POWER~~ by Required Action A.1	AND A.3 Reduce Overpower ΔT trip setpoints ≥ 1% for each 1% ~~$F_Q(Z)$~~ exceeds ~~steady state limit.~~ WCAP-17661-P-A	72 hours
	AND A.4 Perform SR 3.2.1.1. and SR 3.2.1.2	Prior to increasing THERMAL POWER above the limit of Required Action A.1

TSTF-290-A

(continued)

Proposed TS Markups

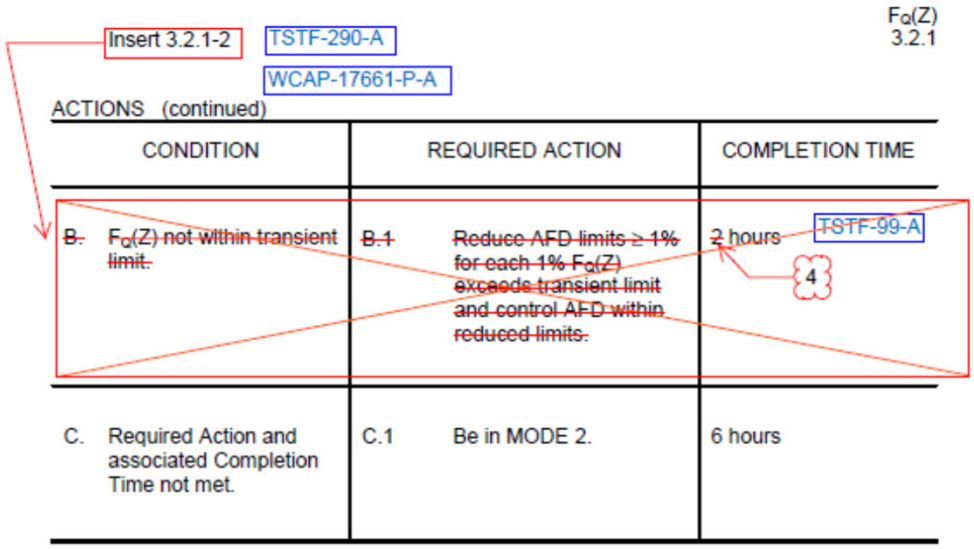
Insert 3.2.1-1
(TSTF-290-A, Insert NOTE A)
(WCAP-17661-P-A, Appendix A)

----------NOTES----------

1. Required Action A.4 shall be completed whenever this Condition is entered ~~prior to increasing THERMAL POWER above the limit of Required Action A.1.~~

2. SR 3.2.1.2 is not required to be performed if this Condition is entered prior to THERMAL POWER exceeding 75% RTP after ~~a~~ refueling.

Proposed TS Markups



Insert 3.2.1-2 TSTF-290-A WCAP-17661-P-A

$F_Q(Z)$ 3.2.1

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~B. $F_Q(Z)$ not within transient limit.~~	~~B.1 Reduce AFD limits ≥ 1% for each 1% $F_Q(Z)$ exceeds transient limit and control AFD within reduced limits.~~	~~2 hours~~ TSTF-99-A 4
C. Required Action and associated Completion Time not met.	C.1 Be in MODE 2.	6 hours

Proposed TS Markups

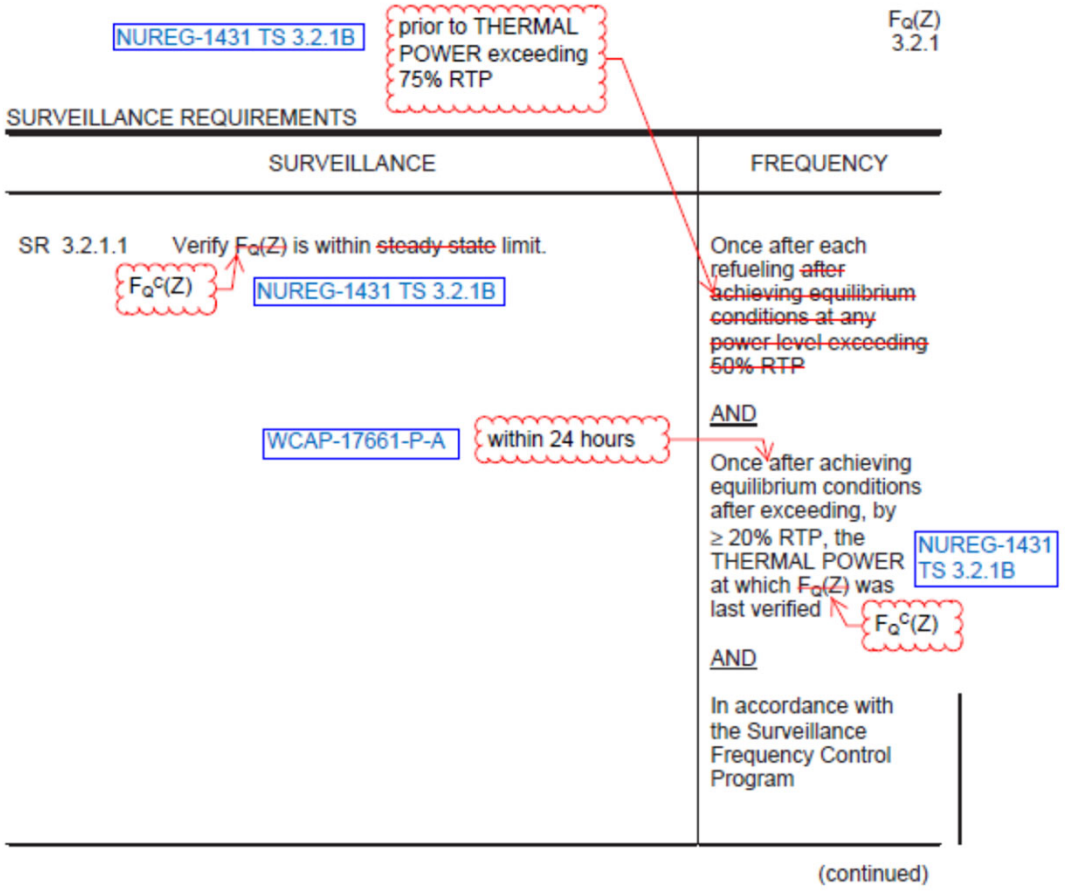
Insert 3.2.1-2
(TSTF-290-A, Insert 1)
(WCAP-17661-P-A, Appendix A)

B.	$F_Q^W(Z)$ not within limits.	B.1.1	Implement a ~~RAOC~~ relaxed axial offset control operating space specified in the COLR that restores $F_Q^W(Z)$ to within ~~its~~ limits.	4 hours
		AND		
		B.1.2	Perform SR 3.2.1.1 and SR 3.2.1.2 if control rod motion is required to comply with ~~the~~ new operating space.	72 hours
		OR		
		B.2.1	----------NOTE---------- Required Action B.2.5 shall be completed whenever Required Action B.2.1 is performed ~~prior to increasing THERMAL POWER above the limit of Required Action B.2.1~~. ---------- Limit THERMAL POWER to less than ~~RATED THERMAL POWER~~ RTP by amount ~~and reduce AFD limits as~~ specified in the COLR.	4 hours
		AND		

Proposed TS Markups

	B.2.2 Reduce AFD limits by amount specified in the COLR.	4 hours
	AND	
	B.2.~~2~~3 Reduce Power Range Neutron Flux — High trip setpoints ≥ 1% for each 1% ~~that~~ THERMAL POWER is limited below RTP ~~RATED THERMAL POWER~~ by Required Action B.2.1.	72 hours
	AND	
	B.2.~~3~~4 Reduce Overpower ΔT trip setpoints ≥ 1% for each 1% ~~that~~ THERMAL POWER is limited below RTP ~~RATED THERMAL POWER~~ by Required Action B.2.1.	72 hours
	AND	
	B.2.~~4~~5 Perform SR 3.2.1.1 and SR 3.2.1.2.	Prior to increasing THERMAL POWER above the limit of Required Action B.2.1

Proposed TS Markups



Proposed TS Markups

$F_Q(Z)$
3.2.1

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.2.1.2 WCAP-17661-P-A ~~NOTE~~ ~~If measurements indicate~~ ~~maximum over Z~~ $\left[\frac{F_Q(Z)}{K(Z)}\right]$ has increased since the previous evaluation of $F_Q(Z)$: ~~a. Increase $F_Q(Z)$ by an appropriate penalty factor specified in the COLR and verify this value is within the transient limits; or~~ ~~b. Repeat SR 3.2.1.2 once per 7 EFPD until either a. above is met or two successive flux maps indicate~~ ~~maximum over Z~~ $\left[\frac{F_Q(Z)}{K(Z)}\right]$ ~~has not increased.~~ Verify $F_Q(Z)$ is within ~~transient~~ limit. $F_Q^W(Z)$ NUREG-1431 TS 3.2.1B	WCAP-17661-P-A within 24 hours after THERMAL POWER exceeds 75% RTP Once after each refueling ~~after achieving equilibrium conditions at any power level exceeding 50% RTP~~ AND (continued)

Proposed TS Markups

$F_Q(Z)$
3.2.1

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.2.1.2 (continued) within 24 hours WCAP-17661-P-A	Once after achieving equilibrium conditions after exceeding, by ≥ 20% RTP, the THERMAL POWER at which ~~$F_Q(Z)$~~ was last verified $F_Q^W(Z)$ NUREG-1431 TS 3.2.1B AND In accordance with the Surveillance Frequency Control Program

Proposed TS Markups

5.6 Reporting Requirements (continued)

5.6.5 Core Operating Limits Report (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

LCO 3.1.1 "SHUTDOWN MARGIN"
LCO 3.1.3 "Moderator Temperature Coefficient"
LCO 3.1.5 "Shutdown Bank Insertion Limits"
LCO 3.1.6 "Control Bank Insertion Limits"
LCO 3.2.1 "Heat Flux Hot Channel Factor"
LCO 3.2.2 "Nuclear Enthalpy Rise Hot Channel Factor"
LCO 3.2.3 "Axial Flux Difference"
LCO 3.9.1 "Boron Concentration"

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

WCAP-9272-P-A, "WESTINGHOUSE RELOAD SAFETY EVALUATION METHODOLOGY," July 1985 (W Proprietary). (Methodology for Moderator Temperature Coefficient, Shutdown Bank Insertion Limit, Control Bank Insertion Limits, and Nuclear Enthalpy Rise Hot Channel Factor.)

WCAP-10216-P-A, Revision 1A, "RELAXATION OF CONSTANT AXIAL OFFSET CONTROL FQ SURVEILLANCE TECHNICAL SPECIFICATION," February, 1994 (W Proprietary). (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) ~~and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).~~)

WCAP-10266-P-A, Revision 2, "The 1981 Version of the Westinghouse ECCS Evaluation Model Using the BASH Code," March 1987. (W Proprietary) (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

WCAP-13749-P-A, "Safety Evaluation Supporting the Conditional Exemption of the Most Negative EOL Moderator Temperature Coefficient Measurement," March 1997.

WCAP-16045-P-A, "Qualification of the Two-Dimensional Transport Code PARAGON," August 2004 (Methodology for Moderator Temperature Coefficient.)

WCAP-16045-P-A, Addendum 1-A, "Qualification of the NEXUS Nuclear Data Methodology," August 2007 (Methodology for Moderator Temperature Coefficient.)

(continued)

Proposed TS Markups

5.6 Reporting Requirements (continued)

5.6.5 Core Operating Limits Report (COLR) (continued)

WCAP-12610-P-A, "VANTAGE+ Fuel Assembly Reference Core Report," April 1995 (Westinghouse Proprietary). (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™," July 2006 (Westinghouse Proprietary). (Methodology for Axial Flux Difference (Relaxed Axial Offset Control) and Heat Flux Hot Channel Factor (W(Z) surveillance requirements for F_Q Methodology).)

Insert VEGP 5.6.5-1

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.6.6 Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)

a. RCS pressure and temperature limits for heatup, cooldown, operation, criticality, and hydrostatic testing as well as heatup and cooldown rates shall be established and documented in the PTLR for the following:

LCO 3.4.3 "RCS Pressure and Temperature (P/T) Limits"

b. The power operated relief valve lift settings required to support the Cold Overpressure Protection Systems (COPS) and the COPS arming temperature shall be established and documented in the PTLR for the following:

LCO 3.4.12 "Cold Overpressure Protection Systems"

c. The analytical methods used to determine the RCS pressure and temperature limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

1. WCAP-14040-A, Rev. 4, "Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves."

(continued)

Proposed TS Markups

Insert VEGP 5.6.5-1

WCAP-17661-P-A, Revision 1, "Improved RAOC and CAOC F_Q Surveillance Technical Specifications," February 2019. (W Proprietary) (Methodology for Heat Flux Hot Channel Factor (T(Z) Surveillance Requirements for FQ Methodology).)

Questions?