Dominion Energy
Pre-Submittal Meeting
License Amendment Request for V.C. Summer Unit 1 Relocation of Cycle-Specific Parameters from TS to COLR and Implementation of WCAP-17661-P-A to TS

Dominion Energy

Agenda

- Purpose
- Technical Basis Summary
- Proposed Changes
- Additional Items
- Precedents
- Conclusions
- Schedule
- Acronyms

Purpose

- Dominion Energy will request approval to change the V.C. Summer (VCS) Unit 1 Technical Specifications (TS) to:
  1. Relocate multiple TS limit values from the TS to the Core Operating Limits Report (COLR);
  2. Implement WCAP-17661-P-A through changes to TS 3/4.2.2.
- Submittal Package will include:
  - Discussion of Changes
  - Marked-up TS pages
  - Marked-up TS Bases changes (for information only)

Technical Basis Summary—Relocate TS Limits to COLR

- This change implements aspects of:
  - Nuclear Regulatory Commission (NRC) approved Technical Specification Task Force Traveler (TSTF) TSTF-339-A, Revision 2,
  - “Relocate TS Parameters to COLR,” TSTF-9-A, Revision 1, “Relocate value for shutdown margin to COLR,”
  - NUREG-1431, Revision 5, “Standard Technical Specifications Westinghouse Plants,” and
  - Generic Letter (GL) GL 88-16, “Removal of Cycle-Specific Parameter Limits from Technical Specifications.”
- The TS parameters being relocated are reactor core safety limits, overtemperature ΔT (OTDT) and overpower ΔT (OPDT) setpoint parameters, shutdown margins, Reactor Coolant System (RCS) flow measurement uncertainty, departure from nucleate boiling (DNB) parameters (RCS Tavg and pressurizer (PRZ) pressure), and boron concentration.
- Proposed TS changes are marked in RED.

Proposed Changes for Relocate TS Limits to COLR

TSTF-9-A Implementation

TS 3.1.1.1, “Shutdown Margin – Modes 1 and 2”

- The proposed change will relocate the shutdown margin value from TS 3.1.1.1 to the COLR.
- Proposed TS change:

3.1.1.1 The SHUTDOWN MARGIN shall be within the limit specified in the COLR.

APPLICABILITY: MODES 1, and 2*.

ACTION:

With the SHUTDOWN MARGIN less than the required value, immediately initiate and continue boration at greater than or equal to 30 gpm of a solution containing greater than or equal to 7000 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

Proposed Changes for Relocate TS Limits to COLR

TSTF-9-A Implementation

TS 3.1.1.2, “Shutdown Margin – Modes 3, 4 and 5”

- The proposed change will relocate Figure 3.1-3, ‘Required Shutdown Margin’ from TS 3.1.1.2 to the COLR.
- Proposed TS change:

3.1.1.2 The SHUTDOWN MARGIN shall be within the limits specified in the COLR.

APPLICABILITY: MODES 3, 4 and 5.

ACTION:
With the SHUTDOWN MARGIN less than the required value, immediately initiate and continue boration at greater than or equal to 30 gpm of a solution containing greater than or equal to 7000 ppm boron or equivalent until the required SHUTDOWN MARGIN is restored.

Proposed Changes (cont.)

TSTF-339-A Implementation

TS 2.1.1, “Safety Limits, Reactor Core”

- The proposed changes will relocate Figure 2.1-1, “Reactor Core Safety Limits-Three Loop Operation” to the COLR, redirect the reference for Figure 2.1-1 in TS 2.1.1 to the COLR, and add two safety limits to TS 2.1.1: 1) departure from nucleate boiling ratio and 2) peak fuel centerline temperature (as new TS 2.1.1.a and TS 2.1.1.b, respectively).

- Proposed TS change:

2.1.1 The combination of THERMAL POWER, pressurizer pressure, and the highest operating loop coolant temperature (Tavg) shall not exceed the limits specified in the COLR; and the following Safety Limits shall not be exceeded:

a. The departure from nucleate boiling ratio (DNBR) shall be maintained greater than or equal to 1.17 for the WRB-2 DNB correlation.

b. The peak fuel centerline temperature shall be maintained less than 5080°F decreasing by 9°F per 10,000 MWD/MTU of burnup.

Proposed Changes (cont.)

TSTF-339-A Implementation

TS Table 2.2-1, “Reactor Trip System Instrumentation Trip Setpoints”

- The proposed changes will relocate the OTDT and OPDT setpoint parameters from TS Table 2.2-1, “Reactor Trip System Instrumentation Trip Setpoints” to the COLR. Specifically, the K constant values, time constants utilized in lead-lag controllers for Tavg, indicated Tavg at rated thermal power, penalty function f1(ΔI), and nominal RCS operating pressure parameters in NOTE 1 and NOTE 3 are to be relocated to the COLR.

Proposed Changes (cont.)

TS Table 2.2-1 (cont.)

- Proposed TS change:

NOTE 1: Overtemperature ΔT

$$\Delta T \leq \Delta T_0 \left[K_1 - K_2 \frac{(1+\tau_1 S)}{(1+\tau_2 S)} [T - T'] + K_3 (P - P') - f_1(\Delta I) \right]$$

Where:

ΔT	=	Measured ΔT by RTD Instrumentation
ΔT_0	≤	Indicated ΔT at RATED THERMAL POWER
K_1	≤	[*]
K_2	≥	[*]/°F
$\frac{1+\tau_1 S}{1+\tau_2 S}$	=	The function generated by the lead-lag controller for T_{avg} dynamic compensation
τ_1, τ_2	=	Time constants utilized in lead – lag controller for T_{avg}
		$\tau_1 \geq$ [*] secs, $\tau_2 \leq$ [*] secs
T	=	Average temperature, °F
T'	≤	Indicated T_{avg} at RATED THERMAL POWER, [*]°F ≤ T' ≤ [*]°F
K_3	≥	[*]/psi
P	=	Pressurizer pressure, psig
P'	≥	[*] psig, Nominal RCS operating pressure
S	=	Laplace transform operator, sec^{-1}
$f_1(\Delta I)$	=	[*] {[*] – (q_t - q_b)} when q_t - q_b ≤ [*]% RTP
		0% of RTP when [*]% RTP < q_t - q_b < [*]% RTP
		[*] {(q_t - q_b) – [*]} when q_t - q_b ≥ [*]% RTP

The values denoted with [*] are specified in the COLR.

NOTE 3: Overpower ΔT

$$\Delta T \leq \Delta T_0 \left[K_4 - K_5 \frac{(\tau_3 S)}{(1+\tau_3 S)} T - K_6 [T - T''] \right]$$

Where:

ΔT	=	as defined in Note 1
ΔT_0	=	as defined in Note 1
K_4	≤	[*]
K_5	≥	[*]/°F for increasing T_{avg}, K_5 = [*]/°F for decreasing T_{avg}
$\frac{\tau_3 S}{1+\tau_3 S}$	=	The function generated by the rate-lag controller for T_{avg} dynamic compensation
τ_3	=	Time constant utilized in rate-lag controller for T_{avg}, $\tau_3 \geq$ [*] secs
K_6	≥	[*] /°F for T > T'', and K_6 = [*] for T ≤ T''
T	=	as defined in Note 1
T''	=	Indicated T_{avg} at RATED THERMAL POWER, [*]°F ≤ T'' ≤ [*]°F
S	=	as defined in Note 1

The values denoted with [*] are specified in the COLR.

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Proposed Changes (cont.)

TSTF-339-A Implementation

TS 3.2.5, “DNB Parameters”

- The proposed changes will relocate Table 3.2-1, “DNB Parameters” to the COLR, and redirects the reference for Table 3.2-1 in TS 3.2.5 and 4.2.5 to the COLR.

- Proposed TS change:

3.2.5 The following DNB related parameters shall be maintained within the limits specified in the COLR:

a. Reactor Coolant System T_{avg}.
b. Pressurizer Pressure*

APPLICABILITY: MODE 1.

4.2.5 Each of the DNB related parameters shall be verified to be within their limits in accordance with the Surveillance Frequency Control Program.

*Limit not applicable during either a THERMAL POWER ramp in excess of 5% of RATED THERMAL POWER per minute or a THERMAL POWER step in excess of 10% of RATED POWER.

Proposed Changes (cont.)

NUREG-1431 Consistency

TS 3.2.3, “RCS Flow Rate and Nuclear Enthalpy Rise Hot Channel Factor”

- The proposed change will delete the RCS flow uncertainty of 2.1% (includes 0.1% for feedwater venturi fouling) from TS 3.2.3.c.
- RCS flow uncertainty does not meet any of the TS inclusion categories of 10 CFR 50.36; and does not appear as a TS parameter in NUREG-1431.

Proposed Changes (cont.)

GL 88-16 Implementation

TS 3.9.1, “Boron Concentration”

- TS 3.9.1 defines the restrictive reactivity conditions, in terms of core reactivity (Keff) and boron concentration, in the RCS and refueling canal during MODE 6. The proposed change will relocate the specific boron concentration requirement from TS 3.9.1 to the COLR and redirect the referenced boron concentration value to the COLR. The reactivity condition, Keff, will be deleted.
- Refueling boron concentration is a cycle-specific parameter. This parameter is determined using an NRC-approved methodology, which is currently included in TS 6.9.1.11.
- Limiting condition for operation (LCO) 3.9.1 is applicable in Mode 6, and TS Table 1.1 requires Keff to be ≤ 0.95 in this Mode. Removal of the Keff requirement in TS 3.9.1 LCO and Action will be proposed, since it is redundant to the Mode applicability. This is also consistent with NUREG-1431.

Proposed Changes (cont.)

TS 3.9.1 (cont.)

- Proposed TS change:

3.9.1 The boron concentration of all filled portions of the Reactor Coolant System and the refueling canal shall be maintained within the limit specified in the COLR.

ACTION:
With the requirement of the above specification not satisfied, immediately suspend all operations involving CORE ALTERATIONS or positive reactivity changes and initiate and continue boration at greater than or equal to 30 gpm of a solution containing greater than or equal to 7000 ppm boron or its equivalent until boron concentration is restored within the limit specified in the COLR.

Technical Basis Summary – WCAP-17661-P-A

- Implementation of NRC-approved WCAP-17661-P-A, “Improved RAOC and CAOC F_Q Surveillance Technical Specifications” to address non-conservatisms in NSAL-09-5 and remove the impacts from differences in Measured vs. Predicted Axial Offset on F_Q surveillances
- VCS will still retain both RAOC (Relaxed Axial Offset Control) and CAOC (Constant Axial Offset Control, “Base Load” space at VCS) operating spaces under new methodology
  - Slight difference from precedents but this approach is allowable per WCAP-17661
- Revise “Heat Flux Hot Channel Factor – F_Q (z)” TS 3/4.2.2 and “Core Operating Limits Report” TS 6.9.1.11

Proposed Changes for Implementation of WCAP

- Implementation of WCAP-17661 to resolve NSAL-09-5
- TS 3/4.2.2 will be completely re-written due to the number of changes
- Key differences from current TS
  - Separate evaluation of Steady-state and Transient F_Q (and separate actions if exceeding)
- Same logic, steps, provisions, and time requirements as those in sample TS of NRC-Approved WCAP-17661-P-A
  - Only notable difference from sample TS is retention of Base Load CAOC operating space in addition to RAOC spaces (allowable under WCAP)

Proposed Changes (cont.)

3.2.2 $F_Q(z)$, as approximated by $F_Q^C(z)$ and $F_Q^W(z)$, shall be within the limits specified in the COLR.

Applicability: MODE 1.

Action:

a. With $F_Q^C(z)$ exceeding its limit:
   1. Reduce THERMAL POWER at least 1% for each 1% $F_Q^C(z)$ exceeds the limit within 15 minutes, and
   2. Reduce Power Range Neutron Flux-High trip setpoints at least 1% for each 1% that THERMAL POWER is limited below RATED THERMAL POWER by Action a.1 within the next 72 hours, and
   3. Reduce the Overpower delta T Trip Setpoints by at least 1% for each 1% that THERMAL POWER is limited below RATED THERMAL POWER by Action a.1 within 72 hours, and
   4. Perform SR 4.2.2.2 and SR 4.2.2.3 prior to increasing THERMAL POWER above the limit of Action a.1.*

Proposed Changes (cont.)

b. With $F_Q^W(z)$ exceeding its limit:
    1. Perform one of the following:
        a. Implement a RAOC operating space specified in the COLR that restores $F_Q^W(z)$ to within its limits within 4 hours, and perform SR 4.2.2.2 and SR 4.2.2.3 if control rod motion is required to comply with the new operating space, or
        b. Verify that the requirements of Specification 4.2.2.4 for BASE LOAD operation are satisfied and enter BASE LOAD operation within 4 hours,

    or
    2. Perform all of the following:
        a. Limit THERMAL POWER to less than RATED THERMAL POWER and reduce AFD limits as specified in the COLR within 4 hours**, and
        b. Reduce Power Range Neutron Flux-High trip setpoints at least 1% for each 1% that THERMAL POWER is limited below RATED THERMAL POWER by Action b.2 within the next 72 hours, and
        c. Reduce the Overpower delta T Trip Setpoints by at least 1% for each 1% that THERMAL POWER is limited below RATED THERMAL POWER by Action b.2 within 72 hours, and
        d. Perform SR 4.2.2.2 and SR 4.2.2.3 prior to increasing THERMAL POWER above the limit of Action b.2.

c. If actions required in 3.2.2.a or 3.2.2.b are not completed within the provided times, then be in MODE 2 within 6 hours.

Proposed Changes (cont.)

4.2.2.2 $F_Q^C(z)$ shall be verified to be within its limit according to the following schedule:

a. Once after each refueling prior to THERMAL POWER exceeding 75% RATED THERMAL POWER, and
b. Once within 24 hours after achieving equilibrium conditions after exceeding, by at least 10% of RATED THERMAL POWER, the THERMAL POWER at which $F_Q^C(z)$ was last verified, and
c. Each 31 EFPD thereafter, or
d. In accordance with the Surveillance Frequency Control Program.
e. For BASE LOAD Operation, in conjunction with target axial flux difference determination prior to entering BASE LOAD operation after satisfying Specification 4.2.2.4 unless a core power distribution measurement has been obtained in accordance with the Surveillance Frequency Control Program with the THERMAL POWER having been maintained above APL^{ND} for the 24 hours prior to measurement.

Proposed Changes (cont.)

4.2.2.3 $F_Q^W(z)$ shall be verified to be within its limit according to the following schedule:

a. Once after each refueling within 24 hours after achieving equilibrium conditions after THERMAL POWER exceeds 75% RATED THERMAL POWER, and
b. Once within 24 hours after achieving equilibrium conditions after exceeding, by at least 10% of RATED THERMAL POWER, the THERMAL POWER at which $F_Q^W(z)$ was last verified, and
c. Each 31 EFPD thereafter, or
d. In accordance with the Surveillance Frequency Control Program.
e. For BASE LOAD Operation, in conjunction with target axial flux difference determination prior to entering BASE LOAD operation after satisfying Specification 4.2.2.4 unless a core power distribution measurement has been obtained in accordance with the Surveillance Frequency Control Program with the THERMAL POWER having been maintained above APL^{ND} for the 24 hours prior to measurement.

Proposed Changes (cont.)

4.2.2.4 BASE LOAD operation is permitted at powers above APL^{ND} if the following conditions are satisfied:

a. Prior to entering BASE LOAD operation, maintain THERMAL POWER above APL^{ND} and less than or equal to that allowed by LCO 3.2.2 for at least the previous 24 hours. Maintain BASE LOAD operation surveillance (AFD within applicable target band about the target flux difference) during this time period. BASE LOAD operation is then permitted providing THERMAL POWER is maintained between APL^{ND} and APL^{BL} or between APL^{ND} and 100% (whichever is the most limiting) and F_Q surveillance is maintained pursuant to Specifications 4.2.2.2 and 4.2.2.3.

b. During BASE LOAD operation, if the THERMAL POWER is decreased below APL^{ND} then RAOC operation is required. The conditions of 4.2.2.4.a shall be satisfied before re-entering BASE LOAD operation.

Proposed Changes (cont.)

TS 6.9.1.11, “CORE OPERATING LIMITS REPORT”

- GL 88-16 requires the NRC approved methodologies used for core operating limits be specified. Therefore, TS 6.9.1.11 will be updated for conformance. Some methodologies, which cover multiple TS limits, are already listed, and will be updated to include additional TS limits to be relocated to the COLR.
- New methodologies added to TS 6.9.1.11 are listed below.

  WCAP-17611-P-A, Rev.1, “Improved RAOC and CAOC FQ Surveillance Technical Specification,” February 2019 (W Proprietary).
  (Methodology for Specifications 3.2.1 – Axial Flux Difference and 3.2.2 – Heat Flux Hot Channel Factor.)

  WCAP-8745-P-A, "Design Bases for the Thermal Overpower ΔT and Thermal Overtemperature ΔT Trip Functions,” September 1986 (W Proprietary).
  (Methodology for Specification 2.2.1-Overtemperature ΔT and Overpower ΔT Trip Functions.)

Additional Items

- Additional editorial changes not listed are made to conform with the TS changes discussed herein.

- VCS's TS has not been converted to the format described in NUREG-1431, "Standard Technical Specifications Westinghouse Plants." NUREG-0452 will be reviewed to ensure alignment with wording.

Precedents

- Precedents for TS Relocation to COLR
  - Surry Units 1 and 2 (ML092960616)
  - Diablo Canyon Units 1 and 2 (ML070160254)
  - Vogtle Units 1 and 2 (ML23101A159)

- Precedents for Implementation of WCAP-17661-P-A
  - Farley Units 1 and 2 (ML22343A255)
  - Vogtle Units 1, 2, 3 and 4 (ML22343A255)

Conclusions

- Dominion Energy is submitting a LAR to allow the relocation of TS safety parameters to the COLR and implementation of WCAP-17661-P-A for V. C. Summer Unit 1.

Schedule

- NRC Pre-Submittal Meeting on 09/09/2024
- LAR Submittal to the NRC expected by end of January 2025
- NRC Approval requested by end of January 2026
- Plan to implement the changes during 2026 Spring outage to minimize cycle impacts

Acronyms

AFD	Axial Flux Distribution
APL	Allowable Power Level
CAOC	Constant Axial Offset Control
COLR	Core Operating Limits Report
DNB	Departure from Nucleate Boiling
DNBR	Departure from Nucleate Boiling Ratio
GL	Generic Letter
LAR	License Amendment Request
LCO	Limiting Condition for Operation
NRC	Nuclear Regulatory Commission
NSAL	Nuclear Safety Advisory Letter
OTDT	Overtemperature ΔT
OPDT	Overpower ΔT
PRZ	Pressurizer
SR	Surveillance Requirement
RAOC	Relaxed Axial Offset Control
RCS	Reactor Coolant System
TS	Technical Specification
TSTF	Technical Specification Task Force Traveler
VCS	V.C. Summer