SHEARON HARRIS NUCLEAR POWER PLANT
NRC DOCKET NO. 50-400/LICENSE NO. NPF-63
REQUEST FOR LICENSE AMENDMENT
TECHNICAL SPECIFICATION TS 3/4.2.2, TS 3/4.2.3, TS 3/4.2.5

TECHNICAL SPECIFICATION PAGES

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TABLE 2.2-1

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TOTAL ALLOWANCE (TA)	Z	SENSOR ERROR (S)	TRIP SETPOINT	ALLOWABLE VALUE
1. Manual Reactor Trip	N.A.	N.A.	N.A.	N.A.	N.A.
2. Power Range, Neutron Flux					
a. High Setpoint	7.5	4.56	0	≤ 109% of RTP** See Note 7	≤ 111.1% of RTP** See Note 7
b. Low Setpoint	8.3	4.56	0	≤ 25% of RTP**	≤ 27.1% of RTP**
3. Power Range, Neutron Flux, High Positive Rate	1.6	0.5	0	≤ 5% of RTP** with a time constant ≥ 2 seconds	≤ 6.3% of RTP** with a time constant ≥ 2 seconds
4. Power Range, Neutron Flux, High Negative Rate	1.6	0.5	0	≤ 5% of RTP** with a time constant ≥ 2 seconds	≤ 6.3% of RTP** with a time constant ≥ 2 seconds
5. Intermediate Range, Neutron Flux	17.0	8.41	0	≤ 25% of RTP**	≤ 30.9% of RTP**
6. Source Range, Neutron Flux	17.0	10.01	0	≤ 10^5 cps	≤ 1.4 x 10^5 cps
7. Overtemperature ΔT	8.7	6.02	Note 5	See Note 1	See Note 2
8. Overpower ΔT	4.7	1.50	1.9	See Note 3	See Note 4
9. Pressurizer Pressure-Low	5.0	2.21	1.5	≥ 1960 psig	≥ 1946 psig
10. Pressurizer Pressure-High	7.5	5.01	0.5	≤ 2385 psig	≤ 2399 psig
11. Pressurizer Water Level-High	8.0	2.18	1.5	≤ 92% of instrument span	≤ 93.8% of instrument span

**RTP = RATED THERMAL POWER

TABLE 2.2-1 (Continued)

TABLE NOTATIONS

NOTE 3: (Continued)

K_6	=	0.002/°F for $T > T''$ and $K_6 = 0$ for $T \leq T''$,
T	=	As defined in Note 1,
T''	=	Indicated T_{avg} at RATED THERMAL POWER (Calibration temperature for ΔT instrumentation, $\leq$ 580.8°F),
S	=	As defined in Note 1, and
$f_2(\Delta I)$	=	0 for all ΔI.

NOTE 4: The channel's maximum Trip Setpoint shall not exceed its computed Trip Setpoint by more than 2.3% ΔT span.

NOTE 5: The sensor error for temperature is 1.9 and 1.1 for pressure.

NOTE 6: The sensor error for steam flow is 0.9, for feed flow is 1.5, and for steam pressure is 0.75.

~~NOTE 7: This value is associated with measured RCS flow $\geq$ [293,540 gpm x (1.0 + C_1)]. Technical Specification 3/4.2.3 requires this setpoint to be reduced at the rate of 1.5% of RTP for each 1% that measured RCS flow is below [293,540 gpm x (1.0 + C_1)].~~

3/4.2.2 HEAT FLUX HOT CHANNEL FACTOR - $F_Q(Z)$

LIMITING CONDITION FOR OPERATION

within the limits specified in the COLR.

3.2.2 $F_Q(Z)$ shall be limited by the following relationships: Delete

Delete

$$F_Q(Z) \le \frac{F_Q^{RTP}}{P} \times K(Z) \text{ FOR } P > 0.5$$

$$F_Q(Z) \le \frac{F_Q^{RTP}}{0.5} \times K(Z) \text{ FOR } P \le 0.5$$

Where:

F_Q^{RTP} =
the F_Q limit at RATED THERMAL POWER specified in the CORE OPERATING LIMITS REPORT (COLR), plant procedure PLP-106,

$P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$, and

K(Z) = the normalized $F_Q(Z)$ as a function of core height specified in the COLR.

APPLICABILITY: MODE 1.

ACTION:

With $F_Q(Z)$ exceeding its limit:

a. Reduce THERMAL POWER at least 1% for each 1% $F_Q(Z)$ exceeds the limit within 15 minutes and similarly reduce the Power Range Neutron Flux-High Trip Setpoints within the next 4 8 hours; POWER OPERATION may proceed for up to a total of 72 hours; subsequent POWER OPERATION may proceed provided the Overpower ΔT Trip Setpoints have been reduced at least 1% for each 1% $F_Q(Z)$ exceeds the limit.

b. Identify and correct the cause of the out-of-limit condition prior to increasing THERMAL POWER above the reduced limit required by ACTION a., above; THERMAL POWER may then be increased provided $F_Q(Z)$ is demonstrated through incore mapping to be within its limit.

 Delete

3/4.2.3 RCS FLOW RATE AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR

LIMITING CONDITION FOR OPERATION

Delete

3.2.3 The combination of indicated Reactor Coolant System (RCS) total flow rate and THERMAL POWER shall be maintained within the region of permissible operation shown on Figure 3.2-3 for three loop operation and $F_{\Delta H}$ shall be maintained as follows:

Within the limits specified in the COLR.

a. $F_{\Delta H} \leq F_{\Delta H}^{RTP}$ [1.0 + $PF_{\Delta H}$ (1.0-P)]

Where:

Delete

$F_{\Delta H}^{RTP}$ = $F_{\Delta H}$ Limit at RATED THERMAL POWER specified in the CORE OPERATING LIMITS REPORT (COLR), plant procedure PLP-106,

$PF_{\Delta H}$ = Power Factor Multiplier for $F_{\Delta H}$ specified in the COLR,

P = $\frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$,

$F_{\Delta H}$ = Enthalpy rise hot channel factor obtained by using the movable incore detectors to obtain a power distribution map, with the measured value of the nuclear enthalpy rise hot channel factor $(F_{\Delta H}^{N})$ increased by an allowance of 4% to account for measurement uncertainty.

APPLICABILITY: MODE 1.

ACTION:

Delete

a. With the combination of RCS total flow rate and THERMAL POWER within the region of prohibited operation shown on Figure 3.2-3 or $F_{\Delta H}$ outside the limits given in 3.2.3a.: Delete

1. Within 2 hours either: (4)

Delete

a) Restore the combination of RCS total flow rate and THERMAL POWER to within the region of permissible operation, and $F_{\Delta H}$ to within the limits given in 3.2.3a., or Delete

b) Restore the combination of RCS total flow rate and THERMAL POWER to within the region of restricted operation and comply with ACTION b. below, or

Insert — Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER and, reduce Power Range Neutron Flux Trip setpoints to less or equal to 55% of RATED THERMAL POWER within the next 4 hours.

 Delete

3/4.2.3 RCS FLOW RATE AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR

LIMITING CONDITION FOR OPERATION

ACTION (Continued):

Delete

c) Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER and reduce the Power Range Neutron Flux - High Trip Setpoint to less than or equal to 55% of RATED THERMAL POWER within the next 4 hours.

b. With the combination of RCS total flow rate and THERMAL POWER within the region of restricted operation (flow rate less than [293,540 gpm x (1.0 + C_1)], which includes measurement uncertainty for core flow, C_1, as described in the Bases), within 6 hours reduce the Power Range Neutron Flux-High Trip Setpoint to below the nominal setpoint by the same amount (% RTP) as the power reduction required by Figure 3.2-3 and maintain $F_{\Delta H}$ at a value that is less than or equal to the value of $F_{\Delta H}$ at RATED THERMAL POWER.

Delete c. Add 2. Within 24 hours of (FΔH) initially being (Delete) within the region of prohibited operation shown on Figure 3.2-3 either: (Add) outside the limits of 3.2.3, verify through incore flux mapping that FΔH is within the limits given in 3.2.3.

Delete

1. Verify through RCS total flow rate determination and incore flux mapping that the combination of RCS total flow rate and THERMAL POWER are restored to within the region of permissible operation, and $F_{\Delta H}$ to within the limits given in 3.2.3a., or

2. Verify through RCS total flow rate determination and incore flux mapping that the combination of RCS total flow rate and THERMAL POWER are restored to within the region of restricted operation and comply with ACTION b. above, or

3. Reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 2 hours.

Delete d. Add 3. Identify and correct the cause of the out-of-limit condition prior to increasing THERMAL POWER above the reduced THERMAL POWER limit required by ACTION a.1.c) and/or c.3), above; Subsequent POWER OPERATION may proceed provided that the combination of THERMAL POWER and indicated RCS total flow rate are demonstrated through RCS total flow rate comparison to be within the regions of restricted or permissible operation shown on Figure 3.2-3 and that $F_{\Delta H}$ is demonstrated through incore flux mapping to be within acceptable limits prior to exceeding the following THERMAL POWER levels: (*) Insert — Delete

Delete

1. a) A nominal 50% of RATED THERMAL POWER,
2. b) A nominal 75% of RATED THERMAL POWER, and
3. c) Within 24 hours of attaining greater than or equal to 95% of RATED THERMAL POWER.

Add b) With the requirements of ACTION 3.2.3.a not met, reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 6 hours.

* THERMAL POWER does not have to be reduced to comply with this ACTION.

Delete

3/4.2.3 RCS FLOW RATE AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR

SURVEILLANCE REQUIREMENTS

4.2.3.1 The provisions of Specification 4.0.4 are not applicable.

4.2.3.2 $F_{\Delta H}$ shall be determined to be within acceptable limits:

a. Prior to operation above 75% of RATED THERMAL POWER after each fuel loading, and

b. At least once per 31 Effective Full Power Days thereafter.

Delete

4.2.3.3 The RCS total flow rate shall be verified to be within the regions of restricted or permissible operation of Figure 3.2-3:

a. At least once per 12 hours by the use of main control board instrumentation or equivalent, and

b. At least once per 31 days by the use of process computer readings or digital voltmeter measurement.

4.2.3.4 The RCS total flow rate indicators shall be subjected to a CHANNEL CALIBRATION at least once per 18 months.

4.2.3.5 The RCS total flow rate shall be determined by precision heat balance measurement at least once per 18 months. The measurement instrumentation shall be calibrated within 21 days prior to the performance of the calorimetric flow measurement.

Delete

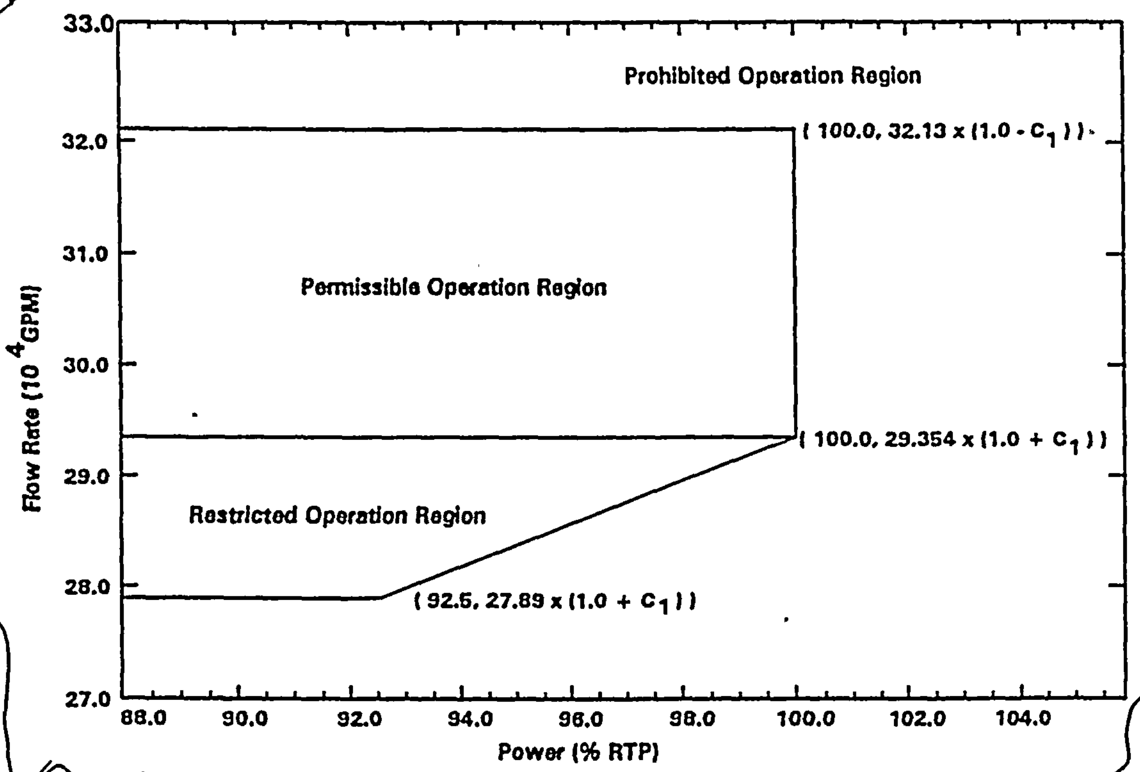

Figure 3.2-3 Deleted (Add)

Delete: Allowed Measured Reactor Coolant System Total Flow Rate versus Power - Three Loops in Operation

3/4.2.5 DNB PARAMETERS

LIMITING CONDITION FOR OPERATION

3.2.5 The following DNB-related parameters shall be maintained within the following limits:

Delete

a. (Indicated) Reactor Coolant System T_{avg} ≤ 586.1°F after addition for instrument uncertainty, and

b. (Indicated) Pressurizer Pressure ≥ 2185 psig* after subtraction for instrument uncertainty. (Delete) (, and) — Add

Add — c. RCS total Flow rate ≥ 293,540 gpm after subtraction for instrument uncertainty.

APPLICABILITY: MODE 1.

ACTION:

With any of the above parameters (exceeding its indicated) [Delete] (not within its specified) [Add] limit, restore the parameter to within its limit within 2 hours or reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next (4) [Delete] (6) [Add] hours.

SURVEILLANCE REQUIREMENTS

Add — 4.2.5.1

Delete — 4.2.5 Each of the parameters shown in Specification 3.2.5 shall be verified to be within its limit at least once per 12 hours.

Add — 4.2.5.2 Verify, by precision heat balance, that RCS total flow rate is within its limit at least once per 18 months.**

ALL CAPS

* This limit is not applicable during either a Thermal Power Ramp in excess of ±5% Rated Thermal Power per minute or a Thermal Power step change in excess of ±10% Rated Thermal Power.

Add — ** Required to be performed within 24 hours after ≥ 95% RATED THERMAL POWER.

Delete

3/4.2.2 AND 3/4.2.3 HEAT FLUX HOT CHANNEL FACTOR, RCS FLOW RATE, AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR

Delete

The limits on heat flux hot channel factor, RCS flow rate, and enthalpy rise hot channel factor ensure that: (1) the design limits on peak local power density and minimum DNBR are not exceeded and (2) in the event of a LOCA the peak fuel clad temperature will not exceed the 2200°F ECCS acceptance criteria limit.

FΔH is not directly

is inferred from a power distribution map obtained with the movable incore detector system. FΔH and FQ(Z)

Delete

Each of these is measurable but will normally only be determined periodically as specified in Specifications 4.2.2 and 4.2.3. This periodic surveillance is sufficient to ensure that the limits are maintained provided:

a. Control rods in a single group move together with no individual rod insertion differing by more than ± 12 steps, indicated, from the group demand position;

b. Control rod groups are sequenced with overlapping groups as described in Specification 3.1.3.6;

Delete

HEAT FLUX HOT CHANNEL FACTOR, AND RCS FLOW RATE AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR (Continued)

c. The control rod insertion limits of Specifications 3.1.3.5 and 3.1.3.6 are maintained; and

d. The axial power distribution, expressed in terms of AXIAL FLUX DIFFERENCE, is maintained within the limits.

Delete

$F_{\Delta H}$ will be maintained within its limits provided Conditions a. through d. above are maintained. The combination of measured RCS flow rate and THERMAL POWER must be maintained within the regions of permissible or restricted operation as shown in Figure 3.2-3 to ensure that the combination of RCS flow rate and THERMAL POWER are within the ranges considered in the mechanical and safety analyses and, along with the measurement of $F_{\Delta H}$, to ensure that the calculated DNBR will not be below the design DNBR value. The relaxation of $F_{\Delta H}$ as a function of THERMAL POWER when in the region of permissible operation allows changes in the radial power shape for all permissible rod insertion limits.

approximately

Delete

For the FSAR Chapter 15 analyses reliant on the Power Range Neutron Flux - High Trip Setting trip function, reduction of the Setpoint by the same percentage as the required power reduction in Figure 3.2-3 (1.5% RTP per 1% RCS flow rate) ensures DNBR margin is maintained. When in the region of restricted operation, defining ΔT_0 as the equivalent ΔT at 100% RTP and [293,540 gpm x (1.0 + C_1)] (which includes measurement uncertainty for core flow) results in an effective OTΔT setpoint reduction and maintains DNBR margins for those analyses reliant upon the OTΔT trip. The additional restrictions on $F_{\Delta H}$ when in the region of restricted operation ensure that the margins gained by the power and setpoint reductions are not reduced by the normally allowable increases in radial peaking at reduced power levels.

Delete

When an $F_{\Delta H}$ measurement is taken, an allowance for measurement error must be applied prior to comparing to the $F_{\Delta H}^{RTP}$ limit(s) specified in the CORE OPERATING LIMITS REPORT (COLR). An allowance of 4% is appropriate for a full-core map taken with the Incore Detector Flux Mapping System.

Margin is maintained between the safety analysis limit DNBR and the design limit DNBR. The margin is more than sufficient to offset any rod bow penalty and transition core penalty.

When an F_Q measurement is taken, an allowance for both experimental error and manufacturing tolerance must be made. An allowance of 5% is appropriate for a full-core map taken with the Incore Detector Flux Mapping System, and a 3% allowance is appropriate for manufacturing tolerance.

The hot channel factor $F_Q^M(Z)$ is measured periodically and increased by a cycle and height dependent power factor V(Z) to provide assurance that the

Delete

HEAT FLUX HOT CHANNEL FACTOR, AND RCS FLOW RATE AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR (Continued)

limit on the hot channel factor, $F_Q(Z)$, is met. V(Z) accounts for the effects of normal operation transients and was determined from expected power control maneuvers over the full range of burnup conditions in the core. The V(Z) function is specified in the COLR.

Deleted

Delete

a) Deleted

b) Deleted

c) Deleted

When RCS flow rate is measured, no additional allowance is necessary prior to comparison with the limit of Specification 3.2.3. A normal RCS flowrate error of 2.1% will be included in C_1, which will be modified as discussed below.

The measurement error for RCS total flow rate is based upon performing a precision heat balance and using the result to calibrate the RCS flow rate indicators. Potential fouling of the feedwater venturi which might not be detected could bias the result from the precision heat balance in a non-conservative manner. Therefore, a penalty of 0.1% for undetected fouling of the feedwater venturi, raises the nominal flow measurement allowance, C_1, to 2.2% for no venturi fouling. Any fouling which might bias the RCS flow rate measurement greater than 0.1% can be detected by monitoring and trending various plant performance parameters. If detected, action shall be taken before performing subsequent precision heat balance measurements, i.e., either the effect of the fouling shall be quantified and compensated for in the RCS flow rate measurement or the venturi shall be cleaned to eliminate the fouling.

The upper limit on measured RCS flow rate in Figure 3.2-3 [321,300 gpm x (1.0 - C_1)] protects the mechanical design flow of 321,300 gpm per FSAR Table 5.1.0-1.

The 12-hour periodic surveillance of indicated RCS flow is sufficient to detect only flow degradation that could lead to operation outside the acceptable region of operation.

Add

Amendment No.

Delete

3/4.2.4 QUADRANT POWER TILT RATIO

The QUADRANT POWER TILT RATIO limit assures that the radial power distribution satisfies the design values used in the power capability analysis. Radial power distribution measurements are made during STARTUP testing and periodically during power operation.

The limit of 1.02, at which corrective action is required, provides DNB and linear heat generation rate protection with x-y plane power tilts. A limiting tilt of 1.025 can be tolerated before the margin for uncertainty in F_Q is depleted. A limit of 1.02 was selected to provide an allowance for the uncertainty associated with the indicated power tilt.

The 2-hour time allowance for operation with a tilt condition greater than 1.02 but less than 1.09 is provided to allow identification and correction of a dropped or misaligned control rod. In the event such action does not correct the tilt, the margin for uncertainty on F_Q is reinstated by reducing the maximum allowed power by 3% for each percent of tilt in excess of 1.

For purposes of monitoring QUADRANT POWER TILT RATIO when one excore detector is inoperable, the movable incore detectors are used to confirm that the normalized symmetric power distribution is consistent with the QUADRANT POWER TILT RATIO. The incore detector monitoring is done with a full incore flux map or two sets of four symmetric thimbles. The preferred sets of four symmetric thimbles is a unique set of eight detector locations. These locations are C-8, E-5, E-11, H-3, H-13, L-5, L-11, N-8. If other locations must be used, a special report to NRC should be submitted within 30 days in accordance with 10CFR50.4.

3/4.2.5 DNB PARAMETERS

The limits on the DNB-related parameters assure that each of the parameters are maintained within the normal steady-state envelope of operation assumed in the transient and accident analyses. The limits are consistent with the initial FSAR assumptions and have been analytically demonstrated adequate to maintain a minimum DNBR that is equal to or greater than the design DNBR value throughout each analyzed transient. The indicated T_{avg} value and the indicated pressurizer pressure value are compared to analytical limits of 586.1°F and 2185 psig, respectively, after an allowance for measurement uncertainty is included.

Insert A

Delete

The 12-hour periodic surveillance of these parameters through instrument readout is sufficient to ensure that the parameters are restored within their limits following load changes and other expected transient operation.

Insert B

Add

Amendment No.

Delete

Insert "A"

When RCS flow rate is measured, an additional allowance is necessary prior to comparison with the limit of Specification 3.2.5.c. Specifically for the precision calorimetric heat balance, a normal RCS flow rate error of 2.1% will be included.

Potential fouling of the feedwater venturi, which might not be detected, could bias the result from the precision heat balance in a non-conservative manner. Therefore, a penalty of 0.1% for undetected fouling of the feedwater venturi, raises the nominal flow measurement allowance to 2.2% for no venturi fouling. Any fouling which might bias the RCS flow rate measurement greater than 0.1% can be detected by monitoring and trending various plant parameters. If detected, action shall be taken before performing subsequent precision heat balance measurements, i.e. either the effect of the fouling shall be quantified and compensated for in the RCS flow rate measurement or the venturi shall be cleaned to eliminate the fouling.

Insert "B"

Surveillance 4.2.5.1 ensures that temperature and pressure parameters, through instrument readout, are restored within their respective limits following load changes and other expected transient operation. The periodic surveillance of indicated RCS flow is intended to detect flow degradation.

Surveillance 4.2.5.2 allows entry into MODE 1, without having performed the surveillance, and placement of the unit in the best condition for performing the surveillance. Measurement of RCS flow rate by performance of a precision calorimetric heat balance allows the installed RCS flow instrumentation to be calibrated and verifies that the actual RCS flow rate is greater than or equal to the minimum required RCS flow rate. The frequency of 18 months reflects the importance of verifying flow following a refueling outage, where work activities were performed that could affect RCS flow. Performance of a precision calorimetric at other times are unnecessary unless changes were introduced that would substantially reduce RCS flow and are likely to produce non-conservative results. The surveillance requirement to perform the precision calorimetric within 24 hours after exceeding 95% RTP is intended to stress the importance of collecting plant flow data as soon as practical after reaching a stable power level that is sufficient for performing the test and in recognition that some plants have experienced feedwater venturi fouling and other phenomena that are more probable as time elapses. If the precision calorimetric data can not be collected in the required time period, it is necessary to reduce power to less than 95% RTP until preparations are complete for collecting precision calorimetric data. Reducing power to less than 95%, resets the allowable time period requirement to perform the precision calorimetric within 24 hours after exceeding 95% RTP.

TABLE 2.2-1

REACTOR TRIP SYSTEM INSTRUMENTATION TRIP SETPOINTS

FUNCTIONAL UNIT	TOTAL ALLOWANCE (TA)	Z	SENSOR ERROR (S)	TRIP SETPOINT	ALLOWABLE VALUE
1. Manual Reactor Trip	N.A.	N.A.	N.A.	N.A.	N.A.
2. Power Range, Neutron Flux					
a. High Setpoint	7.5	4.56	0	≤ 109% of RTP**	≤ 111.1% of RTP**
b. Low Setpoint	8.3	4.56	0	≤ 25% of RTP**	≤ 27.1% of RTP**
3. Power Range, Neutron Flux, High Positive Rate	1.6	0.5	0	≤ 5% of RTP** with a time constant ≥ 2 seconds	≤ 6.3% of RTP** with a time constant ≥ 2 seconds
4. Power Range, Neutron Flux, High Negative Rate	1.6	0.5	0	≤ 5% of RTP** with a time constant ≥ 2 seconds	≤ 6.3% of RTP** with a time constant ≥ 2 seconds
5. Intermediate Range, Neutron Flux	17.0	8.41	0	≤ 25% of RTP**	≤ 30.9% of RTP**
6. Source Range, Neutron Flux	17.0	10.01	0	≤ 10^5 cps	≤ 1.4×10^5 cps
7. Overtemperature ΔT	8.7	6.02	Note 5	See Note 1	See Note 2
8. Overpower ΔT	4.7	1.50	1.9	See Note 3	See Note 4
9. Pressurizer Pressure-Low	5.0	2.21	1.5	≥ 1960 psig	≥ 1946 psig
10. Pressurizer Pressure-High	7.5	5.01	0.5	≤ 2385 psig	≤ 2399 psig
11. Pressurizer Water Level-High	8.0	2.18	1.5	≤ 92% of instrument span	≤ 93.8% of instrument span

**RTP = RATED THERMAL POWER

TABLE 2.2-1 (Continued)

TABLE NOTATIONS

NOTE 3: (Continued)

K_6	=	0.002/°F for T > T" and K_6 = 0 for T ≤ T",
T	=	As defined in Note 1,
T"	=	Indicated T_{avg} at RATED THERMAL POWER (Calibration temperature for ΔT instrumentation, ≤ 580.8°F),
S	=	As defined in Note 1, and
$f_2(\Delta I)$	=	0 for all ΔI.

NOTE 4: The channel's maximum Trip Setpoint shall not exceed its computed Trip Setpoint by more than 2.3% ΔT span.

NOTE 5: The sensor error for temperature is 1.9 and 1.1 for pressure.

NOTE 6: The sensor error for steam flow is 0.9, for feed flow is 1.5, and for steam pressure is 0.75.

3/4.2.2 HEAT FLUX HOT CHANNEL FACTOR - $F_Q(Z)$

LIMITING CONDITION FOR OPERATION

3.2.2 $F_Q(Z)$ shall be within the limits specified in the COLR.

APPLICABILITY: MODE 1.

ACTION:

With $F_Q(Z)$ exceeding its limit:

a. Reduce THERMAL POWER at least 1% for each 1% $F_Q(Z)$ exceeds the limit within 15 minutes and similarly reduce the Power Range Neutron Flux-High Trip Setpoints within the next 8 hours; POWER OPERATION may proceed for up to a total of 72 hours; subsequent POWER OPERATION may proceed provided the Overpower ΔT Trip Setpoints have been reduced at least 1% for each 1% $F_Q(Z)$ exceeds the limit.

b. Identify and correct the cause of the out-of-limit condition prior to increasing THERMAL POWER above the reduced limit required by ACTION a., above; THERMAL POWER may then be increased provided $F_Q(Z)$ is demonstrated through incore mapping to be within its limit.

3/4.2.3 NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR

LIMITING CONDITION FOR OPERATION

3.2.3 $F_{\Delta H}$ shall be within the limits specified in the COLR.

APPLICABILITY: MODE 1.

ACTION:

a. With $F_{\Delta H}$ outside the limits given in 3.2.3:

   1. Within 4 hours either:

      a) Restore $F_{\Delta H}$ to within the limits given in 3.2.3, or

      b) Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER and, reduce Power Range Neutron Flux Trip setpoints to less than or equal to 55% of RATED THERMAL POWER within the next 4 hours.

3/4.2.3 NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR

LIMITING CONDITION FOR OPERATION

ACTION (Continued):

2. Within 24 hours of $F_{\Delta H}$ initially being outside the limits of 3.2.3, verify through incore flux mapping that $F_{\Delta H}$ is within the limits given in 3.2.3.

3. Subsequent POWER OPERATION may proceed provided that $F_{\Delta H}$ is demonstrated through incore flux mapping to be within acceptable limits prior to exceeding the following THERMAL POWER levels*:

   a) 50% RATED THERMAL POWER
   b) 75% RATED THERMAL POWER
   c) Within 24 hours of attaining greater than or equal to 95% RATED THERMAL POWER

b. With the requirements of ACTION 3.2.3.a not met, reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 6 hours.

* THERMAL POWER does not have to be reduced to comply with this ACTION.

3/4.2.3 NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR

SURVEILLANCE REQUIREMENTS

4.2.3.1 The provisions of Specification 4.0.4 are not applicable.

4.2.3.2 $F_{\Delta H}$ shall be determined to be within acceptable limits:

a. Prior to operation above 75% of RATED THERMAL POWER after each fuel loading, and

b. At least once per 31 Effective Full Power Days thereafter.

Figure 3.2-3 Deleted

3/4.2.5 DNB PARAMETERS

LIMITING CONDITION FOR OPERATION

3.2.5 The following DNB-related parameters shall be maintained within the following limits:

a. Reactor Coolant System $T_{avg} \leq 586.1°F$ after addition for instrument uncertainty, and

b. Pressurizer Pressure ≥ 2185 psig* after subtraction for instrument uncertainty, and

c. RCS total flow rate ≥ 293,540 gpm after subtraction for instrument uncertainty.

APPLICABILITY: MODE 1.

ACTION:

With any of the above parameters not within its specified limit, restore the parameter to within its limit within 2 hours or reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 6 hours.

SURVEILLANCE REQUIREMENTS

4.2.5.1 Each of the parameters shown in Specification 3.2.5 shall be verified to be within its limit at least once per 12 hours.

4.2.5.2 Verify, by precision heat balance, that RCS total flow rate is within its limit at least once per 18 months.**

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* This limit is not applicable during either a THERMAL POWER Ramp in excess of ±5% RATED THERMAL POWER per minute or a THERMAL POWER step change in excess of ±10% RATED THERMAL POWER.

** Required to be performed within 24 hours after ≥ 95% RATED THERMAL POWER.

3/4.2.2 AND 3/4.2.3 HEAT FLUX HOT CHANNEL FACTOR AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR

The limits on heat flux hot channel factor and enthalpy rise hot channel factor ensure that: (1) the design limits on peak local power density and minimum DNBR are not exceeded and (2) in the event of a LOCA the peak fuel clad temperature will not exceed the 2200°F ECCS acceptance criteria limit.

$F_{\Delta H}$ is not directly measurable but is inferred from a power distribution map obtained with the movable incore detector system. $F_{\Delta H}$ and $F_Q(Z)$ will normally only be determined periodically as specified in Specifications 4.2.2 and 4.2.3. This periodic surveillance is sufficient to ensure that the limits are maintained provided:

a. Control rods in a single group move together with no individual rod insertion differing by more than ± 12 steps, indicated, from the group demand position;

b. Control rod groups are sequenced with overlapping groups as described in Specification 3.1.3.6;

HEAT FLUX HOT CHANNEL FACTOR NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR (Continued)

c. The control rod insertion limits of Specifications 3.1.3.5 and 3.1.3.6 are maintained; and

d. The axial power distribution, expressed in terms of AXIAL FLUX DIFFERENCE, is maintained within the limits.

$F_{\Delta H}$ will be maintained within its limits provided Conditions a. through d. above are maintained.

For the FSAR Chapter 15 analyses reliant on the Power Range Neutron Flux - High Trip Setting trip function, reduction of the Setpoint by approximately the same percentage as the required power reduction ensures DNBR margin is maintained.

When an $F_{\Delta H}$ measurement is taken, an allowance for measurement error must be applied prior to comparing to the $F_{\Delta H}^{RTP}$ limit(s) specified in the CORE OPERATING LIMITS REPORT (COLR). An allowance of 4% is appropriate for a full-core map taken with the Incore Detector Flux Mapping System.

Margin is maintained between the safety analysis limit DNBR and the design limit DNBR. The margin is more than sufficient to offset any rod bow penalty and transition core penalty.

When an F_Q measurement is taken, an allowance for both experimental error and manufacturing tolerance must be made. An allowance of 5% is appropriate for a full-core map taken with the Incore Detector Flux Mapping System, and a 3% allowance is appropriate for manufacturing tolerance.

The hot channel factor $F_Q^M(Z)$ is measured periodically and increased by a cycle and height dependent power factor V(Z) to provide assurance that the

HEAT FLUX HOT CHANNEL FACTOR AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR (Continued)

limit on the hot channel factor, $F_Q(Z)$, is met. V(Z) accounts for the effects of normal operation transients and was determined from expected power control maneuvers over the full range of burnup conditions in the core. The V(Z) function is specified in the COLR.

3/4.2.4 QUADRANT POWER TILT RATIO

The QUADRANT POWER TILT RATIO limit assures that the radial power distribution satisfies the design values used in the power capability analysis. Radial power distribution measurements are made during STARTUP testing and periodically during power operation.

The limit of 1.02, at which corrective action is required, provides DNB and linear heat generation rate protection with x-y plane power tilts. A limiting tilt of 1.025 can be tolerated before the margin for uncertainty in F_Q is depleted. A limit of 1.02 was selected to provide an allowance for the uncertainty associated with the indicated power tilt.

The 2-hour time allowance for operation with a tilt condition greater than 1.02 but less than 1.09 is provided to allow identification and correction of a dropped or misaligned control rod. In the event such action does not correct the tilt, the margin for uncertainty on F_Q is reinstated by reducing the maximum allowed power by 3% for each percent of tilt in excess of 1.

For purposes of monitoring QUADRANT POWER TILT RATIO when one excore detector is inoperable, the movable incore detectors are used to confirm that the normalized symmetric power distribution is consistent with the QUADRANT POWER TILT RATIO. The incore detector monitoring is done with a full incore flux map or two sets of four symmetric thimbles. The preferred sets of four symmetric thimbles is a unique set of eight detector locations. These locations are C-8, E-5, E-11, H-3, H-13, L-5, L-11, N-8. If other locations must be used, a special report to NRC should be submitted within 30 days in accordance with 10CFR50.4.

3/4.2.5 DNB PARAMETERS

The limits on the DNB-related parameters assure that each of the parameters are maintained within the normal steady-state envelope of operation assumed in the transient and accident analyses. The limits are consistent with the initial FSAR assumptions and have been analytically demonstrated adequate to maintain a minimum DNBR that is equal to or greater than the design DNBR value throughout each analyzed transient. The indicated T_{avg} value and the indicated pressurizer pressure value are compared to analytical limits of 586.1°F and 2185 psig, respectively, after an allowance for measurement uncertainty is included.

When RCS flow rate is measured, an additional allowance is necessary prior to comparison with the limit of Specification 3.2.5.c. Specifically for the precision calorimetric heat balance, a normal RCS flow rate error of 2.1% will be included.

Potential fouling of the feedwater venturi, which might not be detected, could bias the result from the precision heat balance in a non-conservative manner. Therefore, a penalty of 0.1% for undetected fouling of the feedwater venturi, raises the nominal flow measurement allowance to 2.2% for no venturi fouling. Any fouling which might bias the RCS flow rate measurement greater than 0.1% can be detected by monitoring and trending various plant parameters.

3/4.2.5 DNB PARAMETERS (Continued)

If detected, action shall be taken before performing subsequent precision heat balance measurements, i.e. either the effect of the fouling shall be quantified and compensated for in the RCS flow rate measurement or the venturi shall be cleaned to eliminate the fouling.

Surveillance 4.2.5.1 ensures that temperature and pressure parameters, through instrument readout, are restored within their respective limits following load changes and other expected transient operation. The periodic surveillance of indicated RCS flow is intended to detect flow degradation.

Surveillance 4.2.5.2 allows entry into MODE 1, without having performed the surveillance, and placement of the unit in the best condition for performing the surveillance. Measurement of RCS flow rate by performance of a precision calorimetric heat balance allows the installed RCS flow instrumentation to be calibrated and verifies that the actual RCS flow rate is greater than or equal to the minimum required RCS flow rate. The frequency of 18 months reflects the importance of verifying flow following a refueling outage, where work activities were performed that could affect RCS flow. Performance of a precision calorimetric at other times are unnecessary unless changes were introduced that would substantially reduce RCS flow and are likely to produce non-conservative results. The surveillance requirement to perform the precision calorimetric within 24 hours after exceeding 95% RTP is intended to stress the importance of collecting plant flow data as soon as practical after reaching a stable power level that is sufficient for performing the test and in recognition that some plants have experienced feedwater venturi fouling and other phenomena that are more probable as time elapses. If the precision calorimetric data can not be collected in the required time period, it is necessary to reduce power to less than 95% RTP until preparations are complete for collecting precision calorimetric data. Reducing power to less than 95%, resets the allowable time period requirement to perform the precision calorimeter within 24 hours after exceeding 95% RTP.