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April 14, 2005

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
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ULNRC-05138

Ladies and Gentlemen:

DOCKET NUMBER 50-483
CALLAWAY PLANT
UNION ELECTRIC CO.
APPLICATION FOR AMENDMENT TO
FACILITY OPERATING LICENSE NPF-30

AmerenUE herewith transmits an application for amendment to Facility Operating License Number NPF-30 for the Callaway Plant. The proposed amendment would add new Technical Specification (TS) LCO 3.1.9, "RCS Boron Limitations < 500°F," and revise TS 3.3.1, "Reactor Trip System (RTS) Instrumentation." This amendment assures that the required mitigative capability is available, in the form of adequate shutdown margin or an automatic reactor trip, for an uncontrolled rod withdrawal event that may be postulated to occur during low power or subcritical (startup) conditions.

Attachments 1 through 5 provide the Evaluation, Markup of Technical Specifications, Retyped Technical Specifications, Proposed Technical Specification Bases Changes, and Summary of Regulatory Commitments, respectively, in support of this amendment request. Attachment 4 is provided for information only. Final Bases changes will be implemented pursuant to TS 5.5.14, "Technical Specifications Bases Control Program," at the time the amendment is implemented.

It has been determined that this amendment application does not involve a significant hazard consideration as determined per 10 CFR 50.92. Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of this amendment.

The Callaway Onsite Review Committee and Nuclear Safety Review Board have reviewed and approved the attached licensing evaluations and have approved the submittal of this amendment application.

A001

This amendment will be implemented within 90 days of approval. In accordance with 10 CFR 50.91, a copy of this amendment application is being provided to the designated Missouri State official.

If you have questions on this amendment application, please contact us.

Very truly yours,

Keith D. Young
Manager, Regulatory Affairs

Attachments

1 - Evaluation
2 - Markup of Technical Specifications
3 - Retyped Technical Specifications
4 - Proposed Technical Specification Bases Changes
5 - Summary of Regulatory Commitments

cc:

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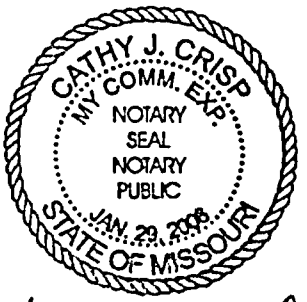

STATE OF MISSOURI)
) S S
COUNTY OF CALLAWAY)

Cathy J. Crisp
Notary Public
State of Missouri
Expiration 1-29-06

Keith D. Young, of lawful age, being first duly sworn upon oath says that he is Manager, Regulatory Affairs, for Union Electric Company; that he has read the foregoing document and knows the content thereof; that he has executed the same for and on behalf of said company with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By Keith D. Young
Keith D. Young
Manager, Regulatory Affairs

SUBSCRIBED and sworn to before me this 14 day of April, 2005.

EVALUATION

EVALUATION

1.0 DESCRIPTION

The proposed amendment would add a new Technical Specification (TS) LCO 3.1.9, "RCS Boron Limitations < 500°F," and revise TS 3.3.1, "Reactor Trip System (RTS) Instrumentation." This amendment assures that the required mitigative capability is available, in the form of adequate SHUTDOWN MARGIN (SDM) or an automatic reactor trip, for an uncontrolled rod cluster control assembly (RCCA) bank withdrawal event that may be postulated to occur during low power or subcritical (startup) conditions.

2.0 PROPOSED CHANGES

The proposed TS changes will add a new LCO 3.1.9, "RCS Boron Limitations < 500°F," and its associated Bases. The new LCO will require that the reactor coolant system (RCS) boron concentration shall be greater than the all-rods-out (ARO) critical boron concentration when the plant is operating within the following LCO Applicability:

- MODE 2 with $k_{eff} < 1.0$ with any RCS cold leg temperature < 500^0F and with Rod Control System capable of rod withdrawal,
- MODE 3 with any RCS cold leg temperature < 500^0F and with Rod Control System capable of rod withdrawal,
- MODES 4 and 5 with Rod Control System capable of rod withdrawal.

If this new LCO is not met when the plant is operating within this Applicability, Required Actions will be initiated immediately, per Condition A of LCO 3.1.9, to:

- Restore the RCS boron concentration to within limit (thereby meeting the LCO), or
- Place the Rod Control System in a condition incapable of rod withdrawal (thereby eliminating the transient initiator), or
- Increase all RCS cold leg temperatures to greater than or equal to 500°F, if the plant is operating in MODE 3 at the time of Condition A entry, so that RTS trip Function 2.b of LCO 3.3.1, Power Range Neutron Flux - Low, is available to mitigate an uncontrolled RCCA bank withdrawal event postulated to occur during low power or subcritical (startup) conditions.

New SR 3.1.9.1 will verify that the LCO is met every 24 hours.

The proposed TS changes will also revise the requirements for RTS trip Function 2.b, Power Range Neutron Flux - Low, in TS Table 3.3.1-1. The Applicability for RTS trip Function 2.b will be revised and new Conditions V, Y, and Z will be added to LCO 3.3.1 for that RTS trip Function.

New footnotes f, h, and i will be added to the Applicability of RTS trip Function 2.b in TS Table 3.3.1-1 to reflect the revised Applicability requirements. These new footnotes will be worded as follows:

(f) With $k_{eff} \geq 1.0$.

(h) With $k_{eff} < 1.0$, and all RCS cold leg temperatures $\geq$ 500°F, and RCS boron concentration $\leq$ the ARO critical boron concentration, and Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

(i) With all RCS cold leg temperatures $\geq$ 500°F, and RCS boron concentration $\leq$ the ARO critical boron concentration, and Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

New footnote (f) will divide the current MODE 2 Applicability for RTS trip Function 2.b into critical and subcritical portions. When the reactor is in MODE 1 below the P-10 setpoint or critical in MODE 2, with $k_{eff} \geq 1.0$ per new footnote (f), failure to meet the Required Channels of TS Table 3.3.1-1 for RTS trip Function 2.b will result in new Condition V entry. New Condition V will be similar to existing Condition E; however, the end state for the plant in new Condition V will be MODE 2 with $k_{eff} < 1.0$ if the inoperable channel is not tripped within 72 hours. Required Actions in the end state of new Condition V will also require the initiation of actions aimed at precluding an uncontrolled RCCA bank withdrawal event from occurring or providing sufficient SDM if such an event were to occur.

When the reactor is subcritical in MODE 2, with $k_{eff} < 1.0$ and the plant meeting the specified conditions in new footnote (h), failure to meet the Required Channels of TS Table 3.3.1-1 for RTS trip Function 2.b will require that new Condition Y, and new Condition Z if applicable, be entered. During the subcritical portion of MODE 2, RTS trip Function 2.b performs a required function only if all RCS cold leg temperatures are greater than or equal to 500°F, and the RCS boron concentration is less than or equal to the ARO critical boron concentration, and the Rod Control System is capable of rod withdrawal or one or more rods are not fully inserted.

The Applicability for RTS trip Function 2.b is also extended to the upper portion of MODE 3 with the plant meeting the specified conditions in new footnote (i). New Conditions Y and Z also apply to this Applicability. In the analysis of the Uncontrolled RCCA Bank Withdrawal from a Low Power or Subcritical Condition event (otherwise referred to hereafter by the acronym RWFS), RTS trip Function 2.b is credited to trip

the reactor when all RCS cold leg temperatures are greater than or equal to 500°F, and the RCS boron concentration is less than or equal to the ARO critical boron concentration, and the Rod Control System is capable of rod withdrawal or one or more rods are not fully inserted.

When the reactor is subcritical in MODE 2 or the plant is in the upper portion of MODE 3, new Conditions Y and Z will cover situations where the Required Channels for RTS trip Function 2.b in Table 3.3.1-1 are not met. Appropriate surveillance requirements have been added to demonstrate OPERABILITY of the trip Function in the revised Applicability. New Condition Y, like new Condition V, will require that an inoperable channel in RTS trip Function 2.b shall be placed in the tripped condition within 72 hours. However, unlike new Condition V which has a Required Action V.2.1 to be in MODE 2 with $k_{eff} < 1.0$ within the next 6 hours if the inoperable channel isn't tripped within 72 hours, new Condition Y also applies to the upper portion of MODE 3 and a more appropriate default state has been added as new Condition Z. If the Required Action and associated Completion Time of new Condition Y is not met, or if RTS trip Function 2.b is unavailable to provide protection for an uncontrolled RWFS event by virtue of multiple channel inoperability, the appropriate default state is to immediately initiate action to eliminate the event initiator by new Required Actions Z.1.1 and Z.1.2 (initiate action to fully insert all rods and place the Rod Control System in a condition incapable of rod withdrawal) or immediately initiate action to borate the RCS to such a boron concentration that the reactor will be maintained subcritical if all rods were completely withdrawn (new Required Action Z.2).

Attachments 2 and 3 provide the TS markups reflecting the above changes and the retyped TS. Attachment 4 provides an information-only copy of the associated TS Bases changes. Attachment 5 lists the regulatory commitments associated with this amendment application.

3.0 BACKGROUND

The control rod drive mechanisms (CRDMs) are wired into pre-selected RCCA banks, such that the RCCA banks can only be withdrawn in their proper withdrawal sequence. The control of the power supplied to the RCCA banks is such that no more than two RCCA banks can be withdrawn at any time.

When the RCCA banks are capable of being withdrawn from the core, i.e., power supplied to the CRDMs during an approach to criticality for reactor startup, or during maintenance and surveillance testing, there is the potential for an inadvertent RCCA bank withdrawal due to a malfunction of the control rod drive system or operator error.

Westinghouse NSAL-00-016 (Reference 7.1) discusses the reactor trip functions assumed in the uncontrolled RWFS event. The primary protection for an uncontrolled RWFS

event is provided by RTS trip Function 2.b, the Power Range Neutron Flux - Low trip Function. The Source Range Neutron Flux RTS trip Function is implicitly credited as the primary reactor trip function for an uncontrolled RWFS event in MODES 3, 4, or 5, since the Power Range Neutron Flux - Low trip Function is not currently required to be OPERABLE in MODE 3 and can not detect neutron levels in the lower temperature portion of MODE 3 nor in MODES 4 and 5. However, the Source Range Neutron Flux trip Function response time is listed as not applicable in FSAR Table 16.3-1 and is not response time tested per SR 3.3.1.16. Therefore, that RTS trip Function can not be credited in the accident analysis to provide protection for an uncontrolled RWFS event in MODES 3, 4, or 5.

NSAL-00-016 also identified that the Power Range Neutron Flux - Low trip Function may not be OPERABLE at RCS temperatures significantly below the hot zero power RCS average temperature due to calibration issues associated with shielding caused by the cold water in the downcomer region of the reactor vessel. Therefore, the Power Range Neutron Flux- Low trip Function may not provide protection in MODE 3 when the RCS temperature is less than 500°F.

Borating the RCS to greater than the ARO critical boron concentration when the RCCA banks are capable of rod withdrawal provides sufficient SDM in the event of an uncontrolled RCCA bank withdrawal event from a subcritical condition when the RCS temperature is less than < 500°F.

4.0 TECHNICAL ANALYSIS

An uncontrolled RCCA bank withdrawal event is analyzed from both a subcritical and low power startup condition. In the FSAR Chapter 15.4 analysis, this event is terminated by the Power Range Neutron Flux - Low trip Function. The Source Range Neutron Flux and Intermediate Range Neutron Flux trip Functions are also available to terminate an RCCA bank withdrawal from subcritical, but are not explicitly credited in the safety analysis to terminate the event.

The Power Range Neutron Flux - Low trip Function is only capable of providing protection for an RCCA bank withdrawal event when the RCS temperature is greater than or equal to 500°F due to calibration issues associated with shielding caused by cold water in the downcomer region of the reactor vessel. Additionally, although not explicitly analyzed while the plant is in MODE 3 when the RCS temperature is less than 500°F nor while the plant is in MODES 4 or 5, the Source Range Neutron Flux trip Function is implicitly credited to provide protection for an RCCA bank withdrawal event occurring from those initial conditions.

Therefore, since there is no explicit RCCA bank withdrawal analysis that is performed for MODE 3 when the RCS temperature is less than 500°F, nor for MODES 4 or 5, new LCO 3.1.9 will require that the RCS is borated to greater than the ARO critical

boron concentration to provide sufficient SDM if the rods are capable of being withdrawn in these MODES. Borating the RCS to greater than the ARO critical boron concentration when the RCCA banks are capable of rod withdrawal provides sufficient SDM in the event of an uncontrolled RCCA bank withdrawal event occurring from a subcritical condition when the RCS temperature is less than 500°F.

New LCO 3.1.9 does not cover that hypothetical portion of MODE 2 with the reactor subcritical ($k_{eff} < 1.0$) and any combination of one or both of the following specified conditions in the Applicability:

- all RCS cold leg temperatures $\geq$ 500°F, or
- Rod Control System incapable of rod withdrawal.

The proposed changes are more restrictive than the existing TS given the additional requirements being added in the form of new LCO 3.1.9 on boration requirements when the RCS temperature is below 500°F and by virtue of extending the Applicability of RTS trip Function 2.b, Power Range Neutron Flux - Low, to the upper portion of MODE 3 with additional Action requirements if required Conditions aren't met. The current Applicability for RTS trip function 2.b includes all of MODE 2 and invokes Condition E for an inoperable channel. The revised Applicability for RTS trip Function 2.b does not cover that limited portion of MODE 2 with the reactor subcritical ($k_{eff} < 1.0$) and any combination of one or more of the following specified conditions in the Applicability:

- any RCS cold leg temperature < 500°F, or
- RCS boron concentration greater than the ARO critical boron concentration, or
- Rod Control System incapable of rod withdrawal and all rods fully inserted.

It is extremely unlikely that the plant could remain in MODE 2 with k_{eff} between 0.99 and 1.0 with the RCS highly borated or all control and shutdown rods fully inserted and the Rod Control System disabled. During the limited portion of MODE 2 excluded by these specified conditions, protection against a positive reactivity transient is provided by virtue of new LCO 3.1.9 such that the protection afforded by RTS trip Function 2.b is not required. Correspondingly, no Condition entry for an inoperable channel in RTS trip Function 2.b is needed for this limited portion of MODE 2. The proposed breakdown of MODE 2 Applicability for RTS trip Function 2.b into critical and subcritical portions is similar to the respective Applicabilities of LCO 3.1.1 for SDM and LCO 3.1.6 for Control Bank Insertion Limits. During the subcritical portion of MODE 2, RTS trip Function 2.b performs a required function only if all RCS cold leg temperatures are greater than or equal to 500°F, and the RCS boron concentration is less than or equal to the ARO critical boron concentration, and the Rod Control System is capable of rod withdrawal or one or more rods are not fully inserted.

5.0 REGULATORY SAFETY ANALYSIS

This section addresses the standards of 10 CFR 50.92 as well as the applicable regulatory requirements and acceptance criteria.

5.1 NO SIGNIFICANT HAZARDS CONSIDERATION (NSHC)

The proposed amendment would add a new Technical Specification (TS) LCO 3.1.9, "RCS Boron Limitations < 500°F," and revise TS 3.3.1, "Reactor Trip System (RTS) Instrumentation." This amendment assures that the required mitigative capability is available, in the form of adequate shutdown margin or an automatic reactor trip, for an uncontrolled RCCA bank withdrawal event that may be postulated to occur during low power or subcritical (startup) conditions.

The proposed changes do not involve a significant hazards consideration for Callaway Plant based on the three standards set forth in 10 CFR 50.92(c) as discussed below:

(1) Do the proposed changes involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

Overall protection system performance will remain within the bounds of the previously performed accident analyses since there are no design changes. The design of the reactor trip system (RTS) instrumentation and engineered safety feature actuation system (ESFAS) instrumentation will be unaffected and these protection systems will continue to function in a manner consistent with the plant design basis. All design, material, and construction standards that were applicable prior to this amendment request will be maintained.

The proposed changes will not adversely affect accident initiators or precursors nor alter the design assumptions, conditions, and configuration of the facility or the manner in which the plant is operated and maintained other than extending the OPERABILITY requirements for RTS trip Function 2.b (Power Range Neutron Flux - Low) to the upper portion of MODE 3. The proposed changes will not alter or prevent the ability of structures, systems, and components (SSCs) from performing their intended functions to mitigate the consequences of an initiating event within the assumed acceptance limits.

As discussed previously the proposed change will add more restrictive requirements in the form of a new LCO 3.1.9 and an expanded LCO Applicability for RTS trip Function 2.b, Power Range Neutron Flux - Low, to provide mitigative capability in the event of an

uncontrolled RCCA bank withdrawal event postulated to occur during low power or subcritical (startup) conditions.

There will be no change to normal plant operating parameters or accident mitigation performance. None of the proposed changes will initiate any accidents; therefore, the probability of an accident will not be increased. There will be no degradation in the performance of, nor an increase in the number of challenges imposed on, safety-related equipment assumed to function during an accident situation.

All accident analysis acceptance criteria will continue to be met with the proposed changes. The proposed changes will not affect the source term, containment isolation, or radiological release assumptions used in evaluating the radiological consequences of an accident previously evaluated. The proposed changes will not alter any assumptions or change any mitigation actions in the radiological consequence evaluations in the FSAR. The applicable radiological dose acceptance criteria will continue to be met.

Therefore, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

(2) Do the proposed changes create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

There are no proposed design changes nor are there any changes in the method by which any safety-related plant SSC performs its safety function. This change will not affect the normal method of plant operation or change any operating parameters. No equipment performance requirements will be affected other than the more restrictive Applicability requirements being imposed on RTS trip Function 2.b, Power Range Neutron Flux - Low, in the upper portion of MODE 3. The proposed changes will not alter any assumptions made in the safety analyses.

No new accident scenarios, transient precursors, failure mechanisms, or limiting single failures will be introduced as a result of this amendment. There will be no adverse effect or challenges imposed on any safety-related system as a result of this amendment.

The proposed amendment will not alter the design or performance of the 7300 Process Protection System, Nuclear Instrumentation System, or Solid State Protection System used in the plant protection systems.

Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any previously evaluated.

(3) Do the proposed changes involve a significant reduction in a margin of safety?

Response: No

There will be no effect on the manner in which safety limits or limiting safety system settings are determined nor will there be any effect on those plant systems necessary to assure the accomplishment of protection functions. There will be no impact on the overpower limit, departure from nucleate boiling ratio (DNBR) limits, heat flux hot channel factor (F_Q), nuclear enthalpy rise hot channel factor ($F\Delta H$), loss of coolant accident peak cladding temperature (LOCA PCT), peak local power density, or any other margin of safety. The applicable radiological dose consequence acceptance criteria will continue to be met.

The proposed changes do not eliminate any RTS or ESFAS surveillances or alter the Frequency of surveillances required by the Technical Specifications. More restrictive changes are proposed by virtue of new LCO 3.1.9 on boration requirements when the RCS temperature is below 500°F and by virtue of extending the Applicability of RTS trip Function 2.b, Power Range Neutron Flux - Low, to the upper portion of MODE 3. The nominal RTS and ESFAS trip setpoints will remain unchanged. None of the acceptance criteria for any accident analysis will be changed.

Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Conclusion:

Based on the above, AmerenUE concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c) and, accordingly, a finding of "no significant hazards consideration" is justified.

5.2 APPLICABLE REGULATORY REQUIREMENTS/CRITERIA

The regulatory bases and guidance documents associated with the systems discussed in this amendment application include:

- NUREG-0800, "U. S. Nuclear Regulatory Commission Standard Review Plan," Section 15.4.1, "Uncontrolled Rod Cluster Control Assembly Bank Withdrawal From a Subcritical or Low-Power Condition" requires that GDC-10, GDC-20, and GDC-25 be met. These criteria are met if DNBR and fuel centerline temperature limits are satisfied.

- GDC-10 requires that specified acceptable fuel design limits shall not be exceeded during normal operation, including the effects of anticipated operational occurrences.

- GDC-13 requires that instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems.

- GDC-20 requires that the protection system(s) shall be designed (1) to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and (2) to sense accident conditions and to initiate the operation of systems and components important to safety.

- GDC-21 requires that the protection system(s) shall be designed for high functional reliability and testability.

- GDC-22 through GDC-25 require various design attributes for the protection system(s), including independence, safe failure modes, separation from control systems, and requirements to assure that specified acceptable fuel design limits are not exceeded in the event of reactivity control malfunctions.

- GDC-26, GDC-28 and GDC 29 require that the plant have two independent reactivity control systems, with at least one of the systems capable of holding the reactor core subcritical under cold conditions, and that specified acceptable fuel design limits are not exceeded during normal operation and anticipated operational occurrences. The maximum reactivity worth of the control and shutdown rods and the maximum rates of reactivity insertion employing the rods and boron removal are limited to values that prevent any reactivity increase from rupturing the reactor coolant system boundary or disrupting the core or vessel internals to a degree that could impair the effectiveness of emergency core cooling. The reactivity control and protection systems are designed to assure an extremely high probability of accomplishing their safety functions in the event of anticipated operational occurrences.

- 10 CFR 50.55a(h) requires that the protection systems meet IEEE 279-1971. Section 4.1 of IEEE 279-1971 discusses the general functional requirement for protection systems that they automatically initiate appropriate protective action whenever a condition monitored by the system reaches a preset level, i.e., the nominal Trip Setpoint.

There are no changes being proposed such that compliance with any of the regulatory requirements and commitments above would come into question. The evaluations documented above confirm that Callaway Plant will continue to comply with all applicable regulatory requirements.

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

AmerenUE has determined that the proposed amendment would change requirements with respect to the installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, AmerenUE has evaluated the proposed amendment and has determined that the amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amount of effluents that may be released offsite, or (iii) a significant increase in the individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22 (c)(9). Therefore, pursuant to 10 CFR 51.22 (b), an environmental assessment of the proposed amendment is not required.

7.0 REFERENCES

7.1 Westinghouse Nuclear Safety Advisory Letter (NSAL) 00-016, "Rod Withdrawal from Subcritical Protection in Lower Modes."

ATTACHMENT 2

MARKUP OF TECHNICAL SPECIFICATIONS

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. RCS lowest operating loop average temperature not within limit.	C.1 Restore RCS lowest operating loop average temperature to within limit.	15 minutes
D. Required Action and associated Completion Time of Condition C not met.	D.1 Be in MODE 3.	15 minutes

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.8.1	Perform a CHANNEL OPERATIONAL TEST on power range and intermediate range channels per SR 3.3.1.7, SR 3.3.1.8, and Table 3.3.1-1.	Prior to initiation of PHYSICS TESTS
SR 3.1.8.2	Verify the RCS lowest operating loop average temperature is $\geq$ 541°F.	30 minutes
SR 3.1.8.3	Verify THERMAL POWER is $\leq$ 5% RTP.	1 hour
SR 3.1.8.4	Verify SDM is within limits provided in the COLR.	24 hours

→ INSERT New LCO 3.1.9

3.1 REACTIVITY CONTROL SYSTEMS

3.1.9 RCS Boron Limitations < 500°F

LCO 3.1.9 The boron concentration of the Reactor Coolant System (RCS) shall be greater than the all rods out (ARO) critical boron concentration.

APPLICABILITY: MODE 2 with k_{eff} < 1.0 with any RCS cold leg temperature < 500°F and with Rod Control System capable of rod withdrawal,
MODE 3 with any RCS cold leg temperature < 500°F and with Rod Control System capable of rod withdrawal,
MODES 4 and 5 with Rod Control System capable of rod withdrawal.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. RCS boron concentration not within limit.	A.1	Initiate boration to restore RCS boron concentration to within limit.	Immediately
	OR		
	A.2	Initiate action to place the Rod Control System in a condition incapable of rod withdrawal.	Immediately
	OR		
	A.3	----------NOTE---------- Not applicable in MODES 4 and 5. ----------	
		Initiate action to increase all RCS cold leg temperatures to ≥ 500°F.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.9.1	Verify RCS boron concentration is greater than the ARO critical boron concentration.	24 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
S. One or more required channel(s) inoperable.	S.1	Verify interlock is in required state for existing unit conditions.	1 hour
	OR		
	S.2	Be in MODE 3.	7 hours
T. One or more required channel(s) inoperable.	T.1	Verify interlock is in required state for existing unit conditions.	1 hour
	OR		
	T.2	Be in MODE 2.	7 hours
U. One trip mechanism inoperable for one RTB.	U.1	Restore inoperable trip mechanism to OPERABLE status.	48 hours
	OR		
	U.2	Be in MODE 3.	54 hours
V. ~~Not used.~~ INSERT 3.3-11			

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
W. One or more Vessel ΔT Equivalent channel(s) inoperable.	W.1 Place channel(s) in trip. OR W.2 Be in MODE 3.	72 hours 78 hours
X. One or more Containment Pressure - Environmental Allowance Modifier channel(s) inoperable.	X.1 Place channel(s) in trip. OR X.2 Be in MODE 3.	72 hours 78 hours

INSERT 3.3-11

INSERT 3.3-11

CONDITION	REQUIRED ACTION	COMPLETION TIME
V. One channel inoperable.	----------NOTE---------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------	
	V.1 Place channel in trip.	72 hours
	OR	
	V.2.1 Be in MODE 2 with k_{eff} < 1.0.	78 hours
	AND	
	V.2.2.1 Initiate action to fully insert all rods.	78 hours
	AND	
	V.2.2.2 Initiate action to place the Rod Control System in a condition incapable of rod withdrawal.	78 hours
	OR	
	V.2.3 Initiate action to borate the RCS to greater than the all rods out (ARO) critical boron concentration.	78 hours
Y. One channel inoperable.	----------NOTE---------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------	
	Y.1 Place channel in trip.	72 hours
Z. Required Action and associated Completion Time of Condition Y not met.	Z.1.1 Initiate action to fully insert all rods.	Immediately
	AND	
OR	Z.1.2 Initiate action to place the Rod Control System in a condition incapable of rod withdrawal.	Immediately
Two or more channels inoperable.	OR	
	Z.2 Initiate action to borate the RCS to greater than the all rods out (ARO) critical boron concentration.	Immediately

Table 3.3.1-1 (page 1 of 8)
Reactor Trip System Instrumentation

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE[a]
1.	Manual Reactor Trip	1,2	2	B	SR 3.3.1.14	NA
		3[b], 4[b], 5[b]	2	C	SR 3.3.1.14	NA
2.	Power Range Neutron Flux					
	a. High	1,2	4	D	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.7 SR 3.3.1.11 SR 3.3.1.16	≤ 112.3% RTP
	INSERT 3.3-17					
	~~b. Low~~	~~1[c], 2~~	~~4~~	~~E~~	~~SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11 SR 3.3.1.16~~	~~≤ 28.3% RTP~~
3.	Power Range Neutron Flux Rate - High Positive Rate	1,2	4	E	SR 3.3.1.7 SR 3.3.1.11 SR 3.3.1.16	≤ 6.3 % RTP with time constant ≥ 2 sec
4.	Intermediate Range Neutron Flux	1[c], 2[d]	2	F, G	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11	≤ 35.3% RTP

(continued)

(a) The Allowable Value defines the limiting safety system setting. See the Bases for the Trip Setpoints.
(b) With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.
(c) Below the P-10 (Power Range Neutron Flux) interlock.
(d) Above the P-6 (Intermediate Range Neutron Flux) interlock.

INSERT 3.3-17

Table 3.3.1-1 (page 1 of 8)
Reactor Trip System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE[a]
2. Power Range Neutron Flux					
b. Low	1[c],2[f]	4	V	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11 SR 3.3.1.16	≤ 28.3% RTP
	2[h], 3[i]	4	Y, Z	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11 SR 3.3.1.16	≤ 28.3% RTP

(a) The Allowable Value defines the limiting safety system setting. See the Bases for the Trip Setpoints.
(b) With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.
(c) Below the P-10 (power Range Neutron Flux) interlock.
(d) Above the P-6 (Intermediate Range Neutron Flux) interlock.
(f) With $k_{eff} \geq 1.0$.
(h) With $k_{eff} < 1.0$, and all RCS cold leg temperatures ≥ 500°F, and RCS boron concentration ≤ the ARO critical boron concentration, and Rod Control System capable of rod withdrawal or one or more rods not fully inserted.
(i) With all RCS cold leg temperatures ≥ 500°F, and RCS boron concentration ≤ the ARO critical boron concentration, and Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

ATTACHMENT 3

RETYPED TECHNICAL SPECIFICATIONS

3.1 REACTIVITY CONTROL SYSTEMS

3.1.9 RCS Boron Limitations < 500°F

LCO 3.1.9 The boron concentration of the Reactor Coolant System (RCS) shall be greater than the all rods out (ARO) critical boron concentration.

APPLICABILITY: MODE 2 with k_{eff} < 1.0 with any RCS cold leg temperature < 500°F and with Rod Control System capable of rod withdrawal,
MODE 3 with any RCS cold leg temperature < 500°F and with Rod Control System capable of rod withdrawal,
MODES 4 and 5 with Rod Control System capable of rod withdrawal.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. RCS boron concentration not within limit.	A.1	Initiate boration to restore RCS boron to within limit.	Immediately
	OR		
	A.2	Initiate action to place the Rod Control System in a condition incapable of rod withdrawal.	Immediately
	OR		
	A.3	---------- NOTE ---------- Not applicable in MODES 4 and 5. ----------	
		Initiate action to increase all RCS cold leg temperatures to ≥ 500°F.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.1.9.1	Verify RCS boron concentration is greater than the ARO critical boron concentration.	24 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
Q. One train inoperable.	---------- NOTE ---------- One train may be bypassed for up to 4 hours for surveillance testing provided the other train is OPERABLE. ----------		
	Q.1	Restore train to OPERABLE status.	24 hours
	OR		
	Q.2	Be in MODE 3.	30 hours
R. One RTB train inoperable.	---------- NOTE ---------- One train may be bypassed for up to 4 hours for surveillance testing provided the other train is OPERABLE. ----------		
	R.1	Restore train to OPERABLE status.	24 hours
	OR		
	R.2	Be in MODE 3.	30 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
S. One or more required channel(s) inoperable.	S.1	Verify interlock is in required state for existing unit conditions.	1 hour
	OR		
	S.2	Be in MODE 3.	7 hours
T. One or more required channel(s) inoperable.	T.1	Verify interlock is in required state for existing unit conditions.	1 hour
	OR		
	T.2	Be in MODE 2.	7 hours
U. One trip mechanism inoperable for one RTB.	U.1	Restore inoperable trip mechanism to OPERABLE status.	48 hours
	OR		
	U.2	Be in MODE 3.	54 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
V. One channel inoperable.	---------- NOTE ---------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------		
	V.1	Place channel in trip.	72 hours
	OR		
	V.2.1	Be in MODE 2 with $k_{eff} < 1.0$.	78 hours
	AND		
	V.2.2.1	Initiate action to fully insert all rods.	78 hours
	AND		
	V.2.2.2	Initiate action to place the Rod Control System in a condition incapable of rod withdrawal.	78 hours
	OR		
	V.2.3	Initiate action to borate the RCS to greater than the all rods out (ARO) critical boron concentration.	78 hours
W. One or more Vessel ΔT Equivalent channel(s) inoperable.	W.1	Place channel(s) in trip.	72 hours
	OR		
	W.2	Be in MODE 3.	78 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
X. One or more Containment Pressure - Environmental Allowance Modifier channel(s) inoperable.	X.1	Place channel(s) in trip.	72 hours
	OR		
	X.2	Be in MODE 3.	78 hours
Y. One channel inoperable.	---------- NOTE ---------- The inoperable channel may be bypassed for up to 12 hours for surveillance testing of other channels. ----------		
	Y.1	Place channel in trip.	72 hours
Z. Required Action and associated Completion Time of Condition Y not met.	Z.1.1	Initiate action to fully insert all rods.	Immediately
	AND		
OR	Z.1.2	Initiate action to place the Rod Control System in a condition incapable of rod withdrawal.	Immediately
Two or more channels inoperable.	OR		
	Z.2	Initiate action to borate the RCS to greater than the all rods out (ARO) critical boron concentration.	Immediately

Table 3.3.1-1 (page 1 of 8)
Reactor Trip System Instrumentation

	FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS	CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE[a]
1.	Manual Reactor Trip	1,2	2	B	SR 3.3.1.14	NA
		3[b], 4[b], 5[b]	2	C	SR 3.3.1.14	NA
2.	Power Range Neutron Flux					
	a. High	1,2	4	D	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.7 SR 3.3.1.11 SR 3.3.1.16	≤ 112.3% RTP
	b. Low	1[c],2[f]	4	V	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11 SR 3.3.1.16	≤ 28.3% RTP
		2[h],3[i]	4	Y, Z	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11 SR 3.3.1.16	≤ 28.3% RTP
3.	Power Range Neutron Flux Rate - High Positive Rate	1,2	4	E	SR 3.3.1.7 SR 3.3.1.11 SR 3.3.1.16	≤ 6.3 % RTP with time constant ≥ 2 sec
4.	Intermediate Range Neutron Flux	1[c], 2[d]	2	F, G	SR 3.3.1.1 SR 3.3.1.8 SR 3.3.1.11	≤ 35.3% RTP

(continued)

(a) The Allowable Value defines the limiting safety system setting. See the Bases for the Trip Setpoints.
(b) With Rod Control System capable of rod withdrawal or one or more rods not fully inserted.
(c) Below the P-10 (Power Range Neutron Flux) interlock.
(d) Above the P-6 (Intermediate Range Neutron Flux) interlock.
(f) With $k_{eff} \geq 1.0$.
(h) With $k_{eff} < 1.0$, and all RCS cold leg temperatures ≥ 500°F, and RCS boron concentration ≤ the ARO critical boron concentration, and Rod Control System capable of rod withdrawal or one or more rods not fully inserted.
(i) With all RCS cold leg temperatures ≥ 500°F, and RCS boron concentration ≤ the ARO critical boron concentration, and Rod Control System capable of rod withdrawal or one or more rods not fully inserted.

ATTACHMENT 4

PROPOSED TECHNICAL SPECIFICATION BASES CHANGES
(for information only)

BASES

REFERENCES (continued)

5. WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology Report," July 1985.

6. WCAP-11618, including Addendum 1, April 1989.

→ INSERT New LCO 3.1.9 Bases

B 3.1 REACTIVITY CONTROL SYSTEMS

B 3.1.9 RCS Boron Limitations < 500°F

BASES

BACKGROUND

The control rod drive mechanisms (CRDMs) are wired into pre-selected RCCA banks, such that the RCCA banks can only be withdrawn in their proper withdrawal sequence during the normal mode of operation (i.e., not in the bank select mode). The control of the power supplied to the RCCA banks is such that no more than two RCCA banks can be withdrawn at any time.

When the RCCA banks are capable of being withdrawn from the core, i.e., power supplied to the CRDMs during an approach to criticality for reactor startup, or during maintenance and surveillance testing, there is the potential for an inadvertent RCCA bank withdrawal due to a malfunction of the control rod drive system.

Westinghouse NSAL-00-016 (Ref. 1) discussed the reactor trip functions assumed in the analysis of an Uncontrolled RCCA Bank Withdrawal from a Low Power or Subcritical Condition event (RWFS) (Ref. 2). The primary protection for an RWFS event is provided by the Power Range Neutron Flux - Low trip Function. The Source Range Neutron Flux trip Function is implicitly credited as the primary reactor trip function for an RWFS event in MODES 3, 4, or 5 since the Power Range Neutron Flux - Low trip Function is not required to be OPERABLE throughout these MODES. However, the Source Range Neutron Flux trip Function response time is listed as not applicable (Ref. 3) and that trip function is not response time tested per SR 3.3.1.16. Therefore, the Source Range Neutron Flux trip Function can not be credited to provide protection for an RWFS event in MODES 3, 4, and 5.

NSAL-00-016 also identified that the Power Range Neutron Flux - Low trip Function may not be OPERABLE at RCS temperatures significantly below the hot zero power T-avg due to calibration issues associated with shielding caused by the cold water in the downcomer region of the reactor vessel. The low RCS temperature limit for OPERABILITY of the Power Range Neutron Flux - Low trip Function is 500°F. Therefore, the Power Range Neutron Flux - Low trip Function may not provide the required protection in MODE 3 when the RCS temperature is < 500°F, nor in MODES 4 and 5, due to the calibration issues discussed above.

Borating the RCS to greater than the all rods out (ARO) critical boron concentration when the RCCA banks are capable being withdrawn provides sufficient SHUTDOWN MARGIN in the event of an RWFS transient when the RCS temperature is < 500°F.

APPLICABLE SAFETY ANALYSES

The RCCA bank withdrawal transient addressed by this LCO is the RWFS event. An RCCA bank withdrawal event at power is also analyzed, but that event is mitigated by equipment covered by the requirements of other Technical Specifications that are applicable in MODE 1, such as the Power Range Neutron Flux - High, Power Range Neutron Flux Rate - High Positive Rate, and

BASES

APPLICABLE SAFETY ANALYSES (continued)

Overtemperature ΔT trip Functions. The RWFS event assumes a positive reactivity insertion rate that is equal to the worth obtained from the simultaneous withdrawal of the combination of the two sequential control banks with the highest combined worth moving together with 100% overlap at the maximum withdrawal speed. The RWFS event is assumed to be terminated by the Power Range Neutron Flux - Low trip Function. The Source Range Neutron Flux and Intermediate Range Neutron Flux trip Functions are also available to terminate an RWFS event, but are not explicitly credited in the safety analyses to terminate the event.

The Power Range Neutron Flux - Low trip Function is available to provide the required protection for an RWFS event when the RCS temperature is $\geq$ 500°F. This temperature limitation is due to calibration issues associated with shielding caused by cold water in the downcomer region of the reactor vessel. Additionally, although not explicitly analyzed in MODES 3, 4, and 5 below 500°F, the Source Range Neutron Flux trip Function is implicitly credited to provide protection for an RWFS event in these MODES.

Since there is no explicit RCCA bank withdrawal analysis that is performed in MODE 3 when the RCS temperature is below 500°F, nor in MODES 4 and 5, and the Power Range Neutron Flux - Low trip Function can not be credited to mitigate an RWFS event with the RCS temperature below 500°F, LCO 3.1.9 requires that the RCS boron concentration be greater than the ARO critical boron concentration when the Rod Control System is capable of rod withdrawal in these MODES. This requirement provides sufficient SHUTDOWN MARGIN to prevent the undesirable consequences (i.e., inadvertent criticality) that could result from an RWFS event.

RCS Boron Limitations < 500°F satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

This LCO requires that the boron concentration of the RCS be greater than the ARO critical boron concentration to provide adequate SHUTDOWN MARGIN in the event of an RWFS transient.

APPLICABILITY

In the event of an RWFS transient, this LCO must be applicable to provide adequate SHUTDOWN MARGIN in the following MODES and specified conditions:

- In MODE 2 with k_{eff} < 1.0 with any RCS cold leg temperature < 500°F and with the Rod Control System capable of rod withdrawal;
- In MODE 3 with any RCS cold leg temperature < 500°F and with the Rod Control System capable of rod withdrawal; and
- In MODES 4 and 5 with the Rod Control System capable of rod withdrawal.

In MODE 6 the requirements of LCO 3.1.9 are not applicable because the Rod Control System is not capable of rod withdrawal.

BASES

APPLICABILITY (continued)

When protection is required to mitigate an RWFS event while operating under specified conditions other than those above in MODES 2 and 3, LCO 3.3.1, "Reactor Trip System," assures that the Power Range Neutron Flux - Low trip Function is OPERABLE to mitigate the event.

In MODE 1 the requirements of LCO 3.1.9 are not applicable since an uncontrolled RCCA bank withdrawal event at power would be mitigated by the Power Range Neutron Flux - High trip Function, or the Power Range Neutron Flux Rate - High Positive Rate trip Function, or the Overtemperature ΔT trip Function, all of which are required to be OPERABLE by LCO 3.3.1, "Reactor Trip System."

Since this Specification has no LCO 3.0.4.c allowance, MODE 5 can not be entered from MODE 6 while not meeting the RCS boron concentration limits. The risk assessments of LCO 3.0.4.b may only be utilized for systems and components, not Criterion 2 values or parameters such as RCS boron concentration. Therefore, a risk assessment per LCO 3.0.4.b to allow MODE changes with single or multiple system/equipment inoperabilities can not be used to allow a MODE change into, or ascending within, this LCO while not meeting the RCS boron concentration limits, even if the risk assessment specifically includes consideration of RCS boron concentration.

ACTIONS

A.1

If the RCS boron concentration is not within limit, action must be taken immediately to restore the boron concentration to within limit. Borating the RCS to a boron concentration greater than the ARO critical boron concentration provides sufficient SHUTDOWN MARGIN if an RWFS event should occur. Initiating action immediately to restore the boron concentration to within limit provides assurance that the LCO requirement will be restored in a timely manner. The Completion Time is reasonable, considering the low probability of an RWFS event occurring while restoring the boron concentration to within limit. Additionally, although not explicitly credited as a primary trip function, the Source Range Neutron Flux trip Function would provide protection for an RWFS event during this period of time.

A.2

If the RCS boron concentration is not within limit, an alternate action is to make the Rod Control System incapable of rod withdrawal. This action precludes an RWFS event from occurring with an inadequate SHUTDOWN MARGIN. Initiating action immediately to make the Rod Control System incapable of rod withdrawal provides adequate assurance that the plant is promptly placed in a condition in which the boron concentration requirements of the LCO are no longer required to mitigate the consequences of an RWFS event.

BASES

ACTIONS (continued)

A.3

If the RCS boron concentration is not within limit, another alternate action is to restore all RCS cold leg temperatures to ≥ 500°F. At this RCS temperature the Power Range Neutron Flux - Low trip Function would be available to provide the necessary protection should an RWFS event occur. Initiating action immediately to restore all RCS cold leg temperatures to ≥ 500°F provides adequate assurance that the plant is promptly placed in a condition in which the boron concentration requirements of the LCO are no longer necessary.

Additionally, although not explicitly credited as a primary trip function, the Source Range Neutron Flux trip Function would provide protection for an RWFS event while RCS temperature is being increased.

Required Action A.3 is modified by a Note that states that it is not applicable in MODES 4 and 5. The Note provides assurance that this Required Action would only be taken in MODES 2 and 3 (i.e., during a plant startup) when the RCS temperature can readily be increased to ≥ 500°F. After the RCS cold leg temperatures are increased to ≥ 500°F, the requirements of LCO 3.1.9 are no longer applicable and protection for an RWFS event would be provided by the Power Range Neutron Flux - Low trip Function, which is required to be OPERABLE by LCO 3.3.1, "Reactor Trip System."

SURVEILLANCE REQUIREMENTS

SR 3.1.9.1

This SR ensures that the RCS boron concentration is within limit. The boron concentration is determined periodically by chemical analysis.

A Frequency of 24 hours is adequate based on the time required to significantly dilute the RCS, the various alarms available in the control room, and the heightened awareness in the control room when the rods are capable of being withdrawn.

REFERENCES

1. Westinghouse Nuclear Safety Advisory Letter NSAL-00-016, "Rod Withdrawal from Subcritical Protection in Lower Modes," December 4, 2000.

2. FSAR Section 15.4.1.

3. FSAR Table 16.3-1.

BASES

APPLICABLE SAFETY ANALYSES, LCO, AND APPLICABILITY

a. Power Range Neutron Flux - High (continued)

These excursions can be caused by ~~rod~~ withdrawal of an uncontrolled RCCA bank, or reductions in RCS temperature. , rod ejection,

The LCO requires all four of the Power Range Neutron Flux - High channels to be OPERABLE (two-out-of-four trip logic). The Trip Setpoint is ≤ 109% RTP.

In MODE 1 or 2, when a positive reactivity excursion could occur, the Power Range Neutron Flux - High trip must be OPERABLE. This Function will terminate the reactivity excursion and shut down the reactor prior to reaching a power level that could damage the fuel. In MODE 3, 4, 5, or 6, the NIS power range detectors cannot detect neutron levels. In ~~these~~ MODES 3, 4, 5, or 6 (with any RCS cold leg temperature < 500°F), the Power Range Neutron Flux - High does not have to be OPERABLE because the reactor is shut down and reactivity excursions into the power range are extremely unlikely. Other RTS Functions and administrative controls provide protection against reactivity additions when in MODE 3, 4, 5, or 6.

b. Power Range Neutron Flux - Low

The LCO requirement for the Power Range Neutron Flux - Low trip Function ensures that protection is provided against a positive reactivity excursion from low power or subcritical conditions. , such as an uncontrolled RCCA bank withdrawal or rod ejection,

The LCO requires all four of the Power Range Neutron Flux - Low channels to be OPERABLE (two-out-of-four trip logic). The Trip Setpoint is ≤ 25% RTP.

INSERT B 3.3.1-9A

In MODE 1, below the Power Range Neutron Flux (P-10 setpoint), and in MODE 2, the Power Range Neutron Flux-Low trip must be OPERABLE. This Function may be manually blocked by the operator when two out of four power range channels are greater than 10% RTP (P-10 setpoint). This Function is automatically unblocked when three out of four power range channels are below the P-10 setpoint. Above the P-10 setpoint, positive reactivity ~~additions~~ excursions are mitigated by the Power Range Neutron Flux-High trip Function.

INSERT B 3.3.1-9B

~~In MODE 3, 4, 5, or 6,~~ the Power Range Neutron Flux - Low trip Function does not have to be OPERABLE because the reactor is shut down and the NIS power range

(continued)

INSERT B 3.3.1-9A

with $k_{eff} \geq 1.0$; and in MODE 2 with $k_{eff} < 1.0$, and all RCS cold leg temperatures $\geq$ 500°F, and the RCS boron concentration less than or equal to the all-rods-out (ARO) critical boron concentration, and the Rod Control System capable of rod withdrawal or one or more rods not fully inserted; and in MODE 3 with all RCS cold leg temperatures $\geq$ 500°F, and the RCS boron concentration less than or equal to the ARO critical boron concentration, and the Rod Control System capable of rod withdrawal or one or more rods not fully inserted,

INSERT B 3.3.1-9B

The Power Range Neutron Flux - Low trip Function does not have to be OPERABLE in MODE 2 with the reactor subcritical ($k_{eff} < 1.0$) and any combination of one or more of the following specified conditions in the Applicability, nor does this trip Function have to be OPERABLE in MODE 3 with any combination of one or more of the following specified conditions in the Applicability:

- any RCS cold leg temperature < 500°F, or
- RCS boron concentration greater than the ARO critical boron concentration, or
- Rod Control System incapable of rod withdrawal and all rods fully inserted.

Accident analysis acceptance criteria with the reactor subcritical, and any RCS cold leg temperature < 500°F, and with the Rod Control System capable of rod withdrawal are satisfied by virtue of the RCS boration requirements of LCO 3.1.9, "RCS Boron Limitations < 500°F." Acceptance criteria are satisfied, and the protection provided by the Power Range Neutron Flux - Low trip Function is not required, if the RCS boron concentration is greater than the ARO critical boron concentration or the Rod Control System is rendered incapable of rod withdrawal per the requirements of LCO 3.1.9.

In addition, in MODE 3 (with any RCS cold leg temperature < 500°F, or the RCS sufficiently borated, or the RCCA bank withdrawal event precluded per the specified conditions of footnote (i) in Table 3.3.1-1), 4, 5, or 6

BASES

APPLICABLE SAFETY ANALYSES, LCO, AND APPLICABILITY

b. Power Range Neutron Flux - Low (continued)

detectors cannot detect neutron levels in this range. Other RTS trip Functions and administrative controls provide protection against positive reactivity ~~additions or power excursions in MODE 3, 4, 5, or 6.~~ these MODES and specified conditions in the Applicability.

3. Power Range Neutron Flux Rate

The Power Range Neutron Flux Rate trip uses the same channels as discussed for Function 2 above.

Power Range Neutron Flux - High Positive Rate

The Power Range Neutron Flux - High Positive Rate trip Function ensures that protection is provided against rapid increases in neutron flux that are characteristic of an RCCA drive rod housing rupture and the accompanying ejection of the RCCA. This Function compliments the Power Range Neutron Flux - High and Low Setpoint trip Functions to ensure that the criteria are met for a rod ejection from the power range. This Function also provides protection for the ~~rod~~ withdrawal at power event. uncontrolled RCCA bank

The LCO requires all four of the Power Range Neutron Flux - High Positive Rate channels to be OPERABLE (two-out-of-four trip logic). The Trip Setpoint is ≤ 4.25% RTP with a time constant ≥ 2 seconds.

In MODE 1 or 2, when there is a potential to add a large amount of positive reactivity from a rod ejection accident (REA), the Power Range Neutron Flux- High Positive Rate trip must be OPERABLE. In MODE 3, 4, 5, or 6, the Power Range Neutron Flux- High Positive Rate trip Function does not have to be OPERABLE because other RTS trip Functions and administrative controls will provide protection against positive reactivity ~~additions.~~ Also, since only the shutdown banks may be withdrawn in MODE 3, 4, or 5, the remaining complement of control bank worth ensures a sufficient degree of SDM in the event of an REA. In MODE 6, no rods are withdrawn and the SDM is increased during refueling operations. The reactor vessel head is also removed or the closure bolts are detensioned preventing any pressure buildup. In addition, the NIS power range detectors cannot detect neutron levels ~~present in this mode.~~ when RCS temperatures are less than 500°F. excursions.

(continued)

BASES

APPLICABLE SAFETY ANALYSES, LCO, AND APPLICABILITY (continued)

4. Intermediate Range Neutron Flux

The Intermediate Range Neutron Flux trip Function ensures that protection is provided against an uncontrolled RCCA bank ~~rod~~ withdrawal accident from a subcritical condition during startup (automatic rod withdrawal is no longer available). This trip Function provides redundant protection to the Power Range Neutron Flux - Low Setpoint trip Function. The NIS intermediate range detectors are located external to the reactor vessel and measure neutrons leaking from the core. The NIS intermediate range detectors do not provide any input to control systems. Note that this Function also provides a signal to prevent rod withdrawal prior to initiating a reactor trip. Limiting further rod withdrawal may terminate the transient and eliminate the need to trip the reactor.

The LCO requires two channels of Intermediate Range Neutron Flux to be OPERABLE. Two OPERABLE channels are sufficient to ensure no single random failure will disable this trip Function (one-out-of-two trip logic). The Trip Setpoint is ≤ 25% RTP.

Because this trip Function is important only during startup, there is generally no need to disable channels for testing while the Function is required to be OPERABLE. Therefore, a third channel is unnecessary.

In MODE 1 below the P-10 setpoint, and in MODE 2 above the P-6 setpoint, when there is a potential for an uncontrolled RCCA bank ~~rod~~ withdrawal accident during reactor startup, the Intermediate Range Neutron Flux trip must be OPERABLE. Above the P-10 setpoint, the Power Range Neutron Flux - High Setpoint trip and the Power Range Neutron Flux - High Positive Rate trip provide core protection for ~~a rod~~ withdrawal accident. In MODE 2 below the P-6 setpoint, the Source Range Neutron Flux trip Function provides core protection for reactivity accidents. In MODE 3, 4, or 5, the Intermediate Range Neutron Flux trip does not have to be OPERABLE ~~because the control rods must be fully inserted and only the shutdown rods may be withdrawn. The reactor cannot be started up in this condition. The core also has the required SDM to mitigate the consequences of a positive reactivity addition accident~~. In MODE 6, all rods are fully inserted and the core has a required increased SDM. Also, the NIS intermediate range detectors cannot detect neutron levels present ~~in this MODE~~ during lower temperatures.

the primary

an uncontrolled RCCA bank

INSERT B 3.3.1-11

(continued)

INSERT B 3.3.1-11

In MODE 3 with all RCS cold leg temperatures $\geq$ 500°F, and the RCS boron concentration less than or equal to the ARO critical boron concentration, and the Rod Control System capable of rod withdrawal or one or more rods not fully inserted, the Power Range Neutron Flux - Low trip Function provides protection for an uncontrolled RCCA bank withdrawal or control rod ejection event from low power or subcritical conditions.

With the Rod Control System capable of rod withdrawal in MODE 3 (with any RCS cold leg temperature < 500°F), MODE 4, or MODE 5, LCO 3.1.9, "RCS Boron Limitations < 500°F," requires that the RCS boron concentration be greater than the all-rods-out (ARO) critical boron concentration to ensure that sufficient SHUTDOWN MARGIN is available if an uncontrolled RCCA bank withdrawal event were to occur.

BASES

APPLICABLE SAFETY ANALYSES, LCO, AND APPLICABILITY (continued)

5. Source Range Neutron Flux

The LCO requirement for the Source Range Neutron Flux trip Function ensures that protection is provided against an uncontrolled RCCA bank ~~rod~~ withdrawal accident from a subcritical condition during startup (automatic rod withdrawal is no longer available). This trip Function provides redundant protection to the Power Range Neutron Flux- Low and Intermediate Range Neutron Flux trip Functions. In MODES 3, 4, and 5, administrative controls also prevent the uncontrolled manual withdrawal of rods. The NIS source range detectors are located external to the reactor vessel and measure neutrons leaking from the core. The NIS source range detectors do not provide any inputs to control systems. The source range trip is the only RTS automatic protection function required in MODES 3, 4, and 5 with the Rod Control System capable of rod withdrawal or one or more rods not fully inserted. ~~Therefore, the functional capability at the Trip Setpoint is assumed to be available.~~ (with any RCS cold leg temperature < 500°F),

INSERT B 3.3.1-12 →

The LCO requires two channels of Source Range Neutron Flux to be OPERABLE. Two OPERABLE channels are sufficient to ensure no single random failure will disable this trip Function. This Function uses one-out-of-two trip logic. The Trip Setpoint is ≤ 1.0 E5 cps. The outputs of the Function to RTS logic are not required OPERABLE in MODE 6 or when all rods are fully inserted and the Rod Control System is incapable of rod withdrawal.

The Source Range Neutron Flux trip Function provides protection for control rod withdrawal from subcritical, boron dilution, and control rod ejection events.

In MODE 2 when below the P-6 setpoint, the Source Range Neutron Flux trip must be OPERABLE. Above the P-6 setpoint, the Intermediate Range Neutron Flux trip and the Power Range Neutron Flux-Low trip will provide core protection for reactivity accidents. Above the P-6 setpoint, the NIS source range neutron flux reactor trip may be manually blocked. When the source range trip is blocked, the high voltage to the detectors is also removed.

In MODES 3, 4, and 5 with the Rod Control System capable of rod withdrawal or one or more rods not fully inserted, the Source Range Neutron Flux trip Function must also be OPERABLE. If the Rod Control System is capable of rod withdrawal, the Source Range Neutron Flux trip must be OPERABLE to provide core protection against a rod withdrawal accident. If the Rod Control

(continued)

INSERT B 3.3.1-12

In MODE 3 with all RCS cold leg temperatures $\geq$ 500°F, and the RCS boron concentration less than or equal to the ARO critical boron concentration, and the Rod Control System capable of rod withdrawal or one or more rods not fully inserted, the Power Range Neutron Flux - Low trip Function provides protection for an uncontrolled RCCA bank withdrawal or control rod ejection event from low power or subcritical conditions.

With the Rod Control System capable of rod withdrawal in MODE 3 (with any RCS cold leg temperature < 500°F), MODE 4, or MODE 5, LCO 3.1.9, "RCS Boron Limitations < 500°F," requires that the RCS boron concentration be greater than the all-rods-out (ARO) critical boron concentration to ensure that sufficient SHUTDOWN MARGIN (SDM) is available if an uncontrolled RCCA bank withdrawal event were to occur. The safety analyses do not take explicit credit for the Source Range Neutron Flux trip Function as a primary trip to mitigate an uncontrolled RCCA bank withdrawal event or control rod ejection occurring from low power or subcritical conditions since this trip Function is not tested for its response time under SR 3.3.1.16. LCO 3.1.9, "RCS Boron Limitations < 500°F," assures that sufficient SDM is available if an uncontrolled RCCA bank withdrawal were to occur while the plant is operating within that LCO's Applicability and specified conditions.

BASES

APPLICABLE SAFETY ANALYSES, LCO, AND APPLICABILITY

5. Source Range Neutron Flux (continued)

and all rods are fully inserted in MODES 3, 4, and 5

System is not capable of rod withdrawal the source range detectors are not required to trip the reactor. However, their monitoring Function must be OPERABLE to monitor core neutron levels and provide inputs to the BDMS as addressed in LCO 3.3.9, "Boron Dilution Mitigation System (BDMS)," to protect against inadvertent reactivity changes that may occur as a result of events like an uncontrolled boron dilution. The requirements for the NIS source range detectors in MODE 6 are addressed in LCO 3.9.3, "Nuclear Instrumentation."

6. Overtemperature ΔT

The Overtemperature ΔT trip Function is provided to ensure that the design limit DNBR is met. This trip Function also limits the range over which the Overpower ΔT trip Function must provide protection. The inputs to the Overtemperature ΔT trip include pressure, coolant temperature, axial power distribution, and reactor power as indicated by loop ΔT assuming full reactor coolant flow. Protection from violating the DNBR limit is assured for those transients that are slow with respect to delays from the core to the measurement system. The Overtemperature ΔT trip Function uses each loop's ΔT as a measure of reactor power and is compared with a setpoint that is automatically varied with the following parameters:

- reactor coolant average temperature - the Trip Setpoint is varied to correct for changes in coolant density and specific heat capacity with changes in coolant temperature;
- pressurizer pressure - the Trip Setpoint is varied to correct for changes in system pressure; and
- axial power distribution $f(\Delta I)$ - the Trip Setpoint is varied to account for imbalances in the axial power distribution as detected by the NIS upper and lower power range detectors. If axial peaks are greater than the design limits, as indicated by the difference between the upper and lower NIS power range detectors, the Trip Setpoint is reduced.

Dynamic compensation is included for system piping delays from the core to the temperature measurement system.

ΔT_o and T', as used in the Overtemperature ΔT trip, represent the 100% RTP values as measured by the plant for each loop. For

(continued)

BASES

ACTIONS

C.1, C.2.1, AND C.2.2 (continued)

- Automatic Trip Logic.

This action addresses the train orientation of the RTS for these Functions. With one channel or train inoperable, the inoperable channel or train must be restored to OPERABLE status within 48 hours. If the affected Function(s) cannot be restored to OPERABLE status within the allowed 48 hour Completion Time, the unit must be placed in a MODE in which the requirement does not apply. To achieve this status, action must be initiated within the same 48 hours to fully insert all rods and the Rod Control System must be rendered incapable of rod withdrawal within the next hour (e.g., by de-energizing all CRDMs, by opening the RTBs, or de-energizing the motor generator (MG) sets). The additional hour for the latter provides sufficient time to accomplish the action in an orderly manner. With the rods fully inserted and the Rod Control System incapable of rod withdrawal, these Functions are no longer required.

The Completion Time is reasonable considering that in this Condition, the remaining OPERABLE train is adequate to perform the safety function, and given the low probability of an event occurring during this interval.

Risk assessments performed pursuant to LCO 3.0.4.b should consider the desirability of enabling the Rod Control System or allowing one or more rods to be other than fully inserted in MODES 3, 4, or 5 while one train of Function 19 (one RTB train), Function 20 (one trip mechanism for one RTB), or Function 21 (or SSPS logic train) is inoperable and the Reactor Trip System is degraded. The risk assessment should assure that prior to enabling the Rod Control System or allowing one or more rods to be other than fully inserted in MODES 3, 4, or 5, ~~procedural controls have been implemented to maintain the RCS boron concentration sufficient to preclude criticality with all control and shutdown rods fully withdrawn. These administrative controls apply prior to making this Applicability change (i.e., enabling the Rod Control System or allowing one or more rods to be other than fully inserted in MODES 3, 4, or 5); however, if the Applicability change took place, these controls also include immediate actions to borate or insert all rods and disable rod control whenever RCS temperature is below 500°F. This would mitigate any inadvertent rod withdrawal from subcritical transient.~~

LCO 3.1.9, "RCS Boron Limitations < 500°F," is met

(continued)

BASES

ACTIONS

T.1 and T.2 (continued)

verified to be in its required state for the existing unit condition within 1 hour or the unit must be placed in MODE 2 within the next 6 hours. These actions are conservative for the case where power level is being raised. Verifying the interlock status manually, e.g., by observation of the associated permissive annunciator window, accomplishes the interlock's Function. The Completion Time of 1 hour is based on operating experience and the minimum amount of time allowed for manual operator actions. The Completion Time of 6 hours is reasonable, based on operating experience, to reach MODE 2 from full power in an orderly manner and without challenging unit systems.

U.1 and U.2

Condition U applies to the RTB Undervoltage and Shunt Trip Mechanisms, or diverse trip features, in MODES 1 and 2. With one of the diverse trip features inoperable, it must be restored to an OPERABLE status within 48 hours or the unit must be placed in a MODE where the requirement does not apply. This is accomplished by placing the unit in MODE 3 within the next 6 hours (54 hours total time). The Completion Time of 6 hours is a reasonable time, based on operating experience, to reach MODE 3 from full power in an orderly manner and without challenging unit systems.

With the unit in MODE 3, Condition C is entered if the inoperable trip mechanism has not been restored and the Rod Control System is capable of rod withdrawal or one or more rods are not fully inserted. The affected RTB shall not be bypassed while one of the diverse features is inoperable except for the time required to perform maintenance to restore the inoperable trip mechanism to OPERABLE status, consistent with Reference 12.

The Completion Time of 48 hours for Required Action U.1 is reasonable considering that in this Condition there is one remaining diverse trip feature for the affected RTB, and one OPERABLE RTB capable of performing the safety function and given the low probability of an event occurring during this interval.

V.1

~~Not used.~~

INSERT B 3.3.1-43

(continued)

INSERT B 3.3.1-43

V.1, V.2.1, V.2.2.1, V.2.2.2, and V.2.3

Condition V applies to one inoperable Power Range Neutron Flux - Low channel in MODE 1 below the P-10 setpoint and in MODE 2 with $k_{eff} \geq 1.0$. The inoperable channel must be placed in the tripped condition within 72 hours. Placing the channel in the tripped condition results in a partial trip status requiring only a one-out-of-three logic for actuation of this reactor trip function. The 72 hours to place the inoperable channel in the tripped condition is justified in Reference 17.

The Required Action is modified by a Note. The Note allows placing an inoperable channel in the bypassed condition for up to 12 hours while performing routine surveillance testing of the other channels. The 12 hour time limit is justified in Reference 17.

If the inoperable channel can not be placed in the tripped condition within the specified 72-hour Completion Time, the plant must be placed in MODE 2 with $k_{eff} < 1.0$ within 78 hours. In addition, within 78 hours action must be initiated to either fully insert all rods and make the Rod Control System incapable of rod withdrawal or to initiate boration of the RCS to greater than the all-rods-out (ARO) critical boron concentration. Required Actions V.2.2.1 and V.2.2.2 would preclude an uncontrolled RCCA bank withdrawal accident from occurring. Required Action V.2.3 would provide sufficient SHUTDOWN MARGIN if an uncontrolled RCCA bank withdrawal event were to occur.

BASES

ACTIONS (continued)

W.1 and W.2

Condition W applies to the Trip Time Delay (TTD) circuitry enabled for the SG Water Level - Low Low trip Function when THERMAL POWER is less than or equal to 22.41% RTP in MODES 1 and 2. With one or more Vessel ΔT Equivalent (Power-1, Power-2) channel(s) inoperable, the associated Vessel ΔT channel(s) must be placed in the tripped condition within 6 hours. If the inoperability impacts the Power-1 and Power-2 portions of the TTD circuitry (e.g., Vessel ΔT RTD failure), both the Power-1 and Power-2 bistables in the affected protection set(s) are placed in the tripped condition. However, if the inoperability is limited to either the Power-1 or Power-2 portion of the TTD circuitry, only the corresponding Power-1 or Power-2 bistable in the affected protection set(s) is placed in the tripped condition. With one or more TTD circuitry delay timer(s) inoperable, both the Vessel ΔT (Power-1) and Vessel ΔT (Power-2) channels are tripped. This automatically enables a zero time delay for that protection channel with either the normal or adverse containment environment level bistable enabled. The Completion Time of 6 hours is based on Reference 7. If the inoperable channel cannot be placed in the tripped condition within the specified Completion Time, the unit must be placed in a MODE where this Function is not required to be OPERABLE. An additional six hours is allowed to place the unit in MODE 3.

X.1 and X.2

Condition X applies to the Environmental Allowance Modifier (EAM) circuitry for the SG Water Level - Low Low trip Function in MODES 1 and 2. With one or more EAM channel(s) inoperable, they must be placed in the tripped condition within 6 hours. Placing an EAM channel in trip automatically enables the SG Water Level - Low Low (Adverse Containment Environment) bistable for that protection channel, with its higher SG level Trip Setpoint (a higher trip setpoint means a reactor trip would occur sooner). The Completion Time of 6 hours is based on Reference 7. If the inoperable channel cannot be placed in the tripped condition within the specified Completion Time, the unit must be placed in a MODE where this Function is not required to be OPERABLE. An additional six hours is allowed to place the unit in MODE 3.

INSERT B3.3.1-44 →

SURVEILLANCE REQUIREMENTS

The SRs for each RTS Function are identified by the SRs column of Table 3.3.1-1 for that Function.

A Note has been added stating that Table 3.3.1-1 determines which SRs apply to which RTS Functions.

(continued)

INSERT B 3.3.1-44

Y.1

Condition Y applies to one inoperable Power Range Neutron Flux - Low channel in MODE 2 with k_{eff} < 1.0, and all RCS cold leg temperatures ≥ 500°F, and the RCS boron concentration less than or equal to the all-rods-out (ARO) critical boron concentration, and the Rod Control System capable of rod withdrawal or one or more rods not fully inserted. Condition Y also applies to one inoperable Power Range Neutron Flux - Low channel in MODE 3 with all RCS cold leg temperatures ≥ 500°F, and the RCS boron concentration less than or equal to the ARO critical boron concentration, and the Rod Control System capable of rod withdrawal or one or more rods not fully inserted. The inoperable channel must be placed in the tripped condition within 72 hours. Placing the channel in the tripped condition results in a partial trip status requiring only a one-out-of-three logic for actuation of this reactor trip function. The 72 hours to place the inoperable channel in the tripped condition is justified in Reference 17.

The Required Action is modified by a Note. The Note allows placing an inoperable channel in the bypassed condition for up to 12 hours while performing routine surveillance testing of the other channels. The 12 hour time limit is justified in Reference 17.

Z.1.1, Z.1.2, and Z.2

Condition Z applies when the Required Action and associated Completion Time of Condition Y is not met or if two or more channels in the Power Neutron Flux - Low trip Function are inoperable when the plant is operating within the MODES and specified conditions in the Applicability discussed above under Condition Y.

If the inoperable channel can not be placed in the tripped condition within the specified 72-hour Completion Time, or if two or more channels are inoperable, action must be initiated to fully insert all rods and to make the Rod Control System incapable of rod withdrawal. These actions will preclude an uncontrolled RCCA bank withdrawal accident from occurring.

If the inoperable channel can not be placed in the tripped condition within the specified 72-hour Completion Time, or if two or more channels are inoperable, an alternate action is to initiate boration of the RCS to greater than the all-rods-out (ARO) critical boron concentration. Borating the RCS to greater than ARO critical boron concentration would provide sufficient SHUTDOWN MARGIN if an uncontrolled RCCA bank withdrawal event were to occur.

ATTACHMENT 5

SUMMARY OF REGULATORY COMMITMENTS

SUMMARY OF REGULATORY COMMITMENTS

The following table identifies those actions committed to by AmerenUE in this document. Any other statements in this submittal are provided for information purposes and are not considered to be commitments. Please direct questions regarding these commitments to Mr. Dave E. Shafer, Superintendent Licensing, (314) 554-3104.

COMMITMENT	Due Date/Event
The proposed changes to the Callaway Technical Specifications, as well as the associated TS Bases revisions, will be implemented within 90 days after NRC approval of the amendment application.	Within 90 days of amendment approval.