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June 2, 2009
L-09-143

10 CFR 50.90

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT:
Davis-Besse Nuclear Power Station
Docket No. 50-346, License No. NPF-3
License Amendment Request to Exclude the Source Range Neutron Flux Instrument Channel Preamplifier from the CHANNEL CALIBRATION Requirements of Technical Specification (TS) 3.3.9, "Source Range Neutron Flux," and TS 3.9.2, "Nuclear Instrumentation"

Pursuant to 10 CFR 50.90, FirstEnergy Nuclear Operating Company (FENOC) hereby requests an amendment of the Technical Specifications (TS) for the Davis-Besse Nuclear Power Station (DBNPS). The proposed amendment would exclude the source range neutron flux instrument channel preamplifier from the CHANNEL CALIBRATION requirements of TS 3.3.9, "Source Range Neutron Flux," and TS 3.9.2, "Nuclear Instrumentation."

The need for the proposed amendment was identified during the conversion of the DBNPS TS to the Improved Standard Technical Specifications. Review of the source range neutron flux instrument channel revealed the preamplifier is not tested during the performance of the CHANNEL CALIBRATION. As a result, this issue was entered into the FENOC Corrective Action Program.

The enclosure provides a description and evaluation of the proposed amendment. Attachments to the enclosure provide a copy of the existing TS pages marked up to reflect the proposed amendment, re-typed TS pages with the proposed amendment incorporated, and the TS Bases pages marked up to reflect the proposed amendment (submitted for information only).

FENOC requests approval of the proposed license amendment by June 5, 2010. Implementation is planned within 90 days of approval.

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LRK

There are no regulatory commitments contained in this submittal. If there are any questions or if additional information is required, please contact Mr. Thomas A. Lentz, Manager - Fleet Licensing, at (330) 761-6071.

I declare under penalty of perjury that the foregoing is true and correct. Executed on June 2, 2009.

Sincerely,

Barry S. Allen

Enclosure:
Evaluation of Proposed License Amendment

cc: NRC Region III Administrator
NRC Resident Inspector
NRC Project Manager
Executive Director, Ohio Emergency Management Agency,
State of Ohio (NRC Liaison)
Utility Radiological Safety Board

Enclosure
L-09-143

EVALUATION OF PROPOSED LICENSE AMENDMENT

Subject: License Amendment Request to Exclude the Source Range Neutron Flux Instrument Channel Preamplifier from the CHANNEL CALIBRATION Requirements of Technical Specification (TS) 3.3.9, "Source Range Neutron Flux," and TS 3.9.2, "Nuclear Instrumentation."

Attachments:

1. Proposed Technical Specification Changes (Mark Up)

2. Proposed Technical Specification Changes (Re-typed – For Information Only)

3. Proposed Technical Specification Bases Changes (For Information Only)

1.0 SUMMARY DESCRIPTION

This evaluation supports a request to amend Operating License NPF-3 for the Davis-Besse Nuclear Power Station (DBNPS). The proposed amendment would revise DBNPS Technical Specifications (TS) 3.3.9, "Source Range Neutron Flux," and TS 3.9.2, "Nuclear Instrumentation," to exclude testing the source range neutron flux instrument channel preamplifier from the CHANNEL CALIBRATION requirements of the source range neutron flux instrument channels.

The need for the proposed amendment is based, in part, on the instrument channel design and location of the preamplifier, which do not provide a practical means of introducing a test signal upstream of the preamplifier for use in the performance of a CHANNEL CALIBRATION.

2.0 DETAILED DESCRIPTION

TS 3.3.9, "Source Range Neutron Flux," provides the Limiting Condition for Operation (LCO), Applicability, Actions, and Surveillance Requirements (SR) for the source range neutron flux instrument channels during plant startup and shutdown conditions. The TS is applicable in Modes 2, 3, 4, and 5. SR 3.3.9.2 requires the performance of a CHANNEL CALIBRATION. The SR is modified by a NOTE that states the neutron detectors are excluded from the CHANNEL CALIBRATION. The proposed license amendment would revise the NOTE to add the source range neutron flux instrument channel preamplifiers to the exclusion from the CHANNEL CALIBRATION.

TS 3.9.2, "Nuclear Instrumentation," provides the LCO, Applicability, Actions, and SRs for the source range instrumentation during plant refueling (Mode 6). This TS applies to both the source range neutron flux instrument channels and the Post Accident Monitoring (PAM) neutron flux (source range) instrument channels, which are a different design than the source range neutron flux instrument channels. SR 3.9.2.2 requires the performance of a CHANNEL CALIBRATION. The SR is modified by a NOTE which states the neutron detectors are excluded from the CHANNEL CALIBRATION. Since the proposed license amendment only affects the source range neutron flux instrument channels, a second Note will be added to exclude the source range neutron flux instrument channel preamplifier from the CHANNEL CALIBRATION.

Attachment 1 contains a copy of TS 3.3.9 and 3.9.2 marked up with the proposed changes. Attachment 2 contains a copy of TS 3.3.9 and 3.9.2 re-typed with the proposed changes incorporated. Attachment 3 contains a copy of the TS 3.3.9 and 3.9.2 Bases pages marked up with changes that support the proposed TS

changes. The Bases pages are provided for information only. The changes to the Bases pages will be made under 10 CFR 50.59, using the DBNPS Technical Specification Bases Control Program (TS 5.5.13).

3.0 TECHNICAL EVALUATION

3.1 Description of System Design

The source range neutron flux instrument channels monitor the neutron flux level from the source range to the lower end of the intermediate range. The channel measures neutron flux over a range of seven decades, from 0.1 through 10^6 counts per second.

There are two independent and redundant source range neutron flux instrument channels. Each channel receives input from a boron trifloride proportional counter (detector) located outside the reactor but inside the primary shield. When the detector is installed, instrument channel components are adjusted, as needed, to establish the operating high voltage, the discriminator value, and the pulse height. The detectors are located on opposite sides of the core, 180 degrees apart. The detector output signal is sent to a preamplifier which shapes and amplifies the signal.

The design of the source range neutron flux instrument channel requires the preamplifier to be located close to the detector. This is due to the low signal level output of the detector. The preamplifier is located within the containment and is packaged in a splash-proof double box arrangement to minimize concerns associated with continued operation in a high humidity environment. The internal circuitry is mounted on two printed circuit boards located inside the inner box which is insulated from the outer box. The preamplifier does not contain any test jacks.

The preamplifier receives charge pulses of varying height and rate from the neutron detector. The input range of the preamplifier is 0.1 to 10^6 pulses per second (randomly distributed) with an average charge range of 0.5 to 10 pico-Coulomb (pC). The typical output from a proportional counter neutron detector is approximately 2 pC. The input range of the preamplifier is a manufacturing characteristic and is not adjustable. The function of the preamplifier is to shape and amplify these pulses that are the input to the count rate amplifier. A gain link setting is used to adjust the preamplifier output such that the input pulses to the count rate amplifier have a range of -0.5 to -1.0 volts when measured at the count rate amplifier. The pulse height is adjusted following installation of a new detector, subsequent detector setting changes during the life of the detector, or preamplifier replacement by changing the gain link setting. The gain link adjustment is the only adjustable component associated with the preamplifier and does not require adjustment after the initial setting. The output of the

preamplifier is a series of voltage pulses proportional to the input charge pulses and at the same rate as the input charge pulses. The number of pulses or count rate is not changed by operation of the preamplifier. Once the signal is input to the count rate amplifier, the pulse height is compared to a preset level in the discriminator such that the pulses below a threshold value are eliminated. The discriminator is set so that the maximum number of neutron pulses is counted while gamma pulses and low level noise signals are eliminated. The count rate amplifier output is displayed locally, on the plant computer, and in the control room. The output of the count rate amplifier also goes to the rate of change amplifier. The rate of change amplifier determines how rapidly the neutron flux is increasing or decreasing. Both amplifiers are located in the control room and both have test jacks in order to permit on-line, in-situ channel testing. A test module, which is part of the instrument channel, is used to perform on-line, in-situ channel testing.

The preamplifier only has one adjustable component, the gain link adjustment. Once this is set, it is secured in place with screws. After the preamplifier is installed and the gain link is set, the box housing the preamplifier is typically not opened.

The vendor maintenance manual states that no special preamplifier maintenance is required, other than bench testing prior to installation.

The source range neutron flux instrument channels have no safety function and are not assumed to function during any Updated Final Safety Analysis Report (UFSAR) design basis accident or transient analysis.

TS 3.3.9 requires the source range neutron flux instrument channels to be operable during Modes 2, 3, 4, and 5 to provide neutron flux and rate of change indication to the control room operators during startup and shutdown operations. During refueling operations (Mode 6) the channels also provide neutron flux indication to control room operators. This indication allows control room operators to monitor core reactivity and take actions to control reactivity, if warranted.

TS 3.9.2 requires two source range neutron monitors to be operable in Mode 6 for refueling operations. This requirement can be satisfied by the use of one of the above described source range neutron flux instrument channels and one of the PAM neutron flux (source range) instrument channels (TS 3.3.17) or by use of both PAM neutron flux (source range) instrument channels. The PAM instrument channels are a different design than the source range neutron flux instrument channels. The PAM channels are safety grade equipment. The PAM detectors are located outside the reactor but inside the primary shield near the source range neutron flux instrument channel detectors. During refueling

(Mode 6) both types of instrument channels provide neutron flux information to control room operators. In addition, the PAM channels provide an audible indication in the containment and the control room of changes in core reactivity.

3.2 Technical Specification Channel Testing

Source range neutron flux instrument channel OPERABILITY is demonstrated by the performance of CHANNEL CHECKS (SR 3.3.9.1 or 3.9.2.1) at a TS FREQUENCY of every 12 hours and the performance of CHANNEL CALIBRATIONS (SR 3.3.9.2 or 3.9.2.2) at a TS FREQUENCY of every 18 months.

The CHANNEL CHECK is defined as:

> A CHANNEL CHECK shall be the qualitative assessment, by observation, of channel behavior during operation. This determination shall include, where possible, comparison of the channel indication and status to other indications or status derived from independent instrument channels measuring the same parameter.

The channels were designed using the guidance contained in IEEE 279-1968, "Proposed IEEE Criteria for Nuclear Power Plant Protection Systems." A provision of the standard, Section 4.9, requires a means to check the operational availability of each system input sensor during reactor operation. The standard further states that cross-checking between channels that have a known relationship to each other provides an acceptable method of satisfying the operational check.

TS 3.3.9 and TS 3.9.2 both require the performance of CHANNEL CHECKS every 12 hours. Therefore, the proper operation of a source range neutron flux instrument channel can be demonstrated by comparison with the redundant instrument channel. This comparison to determine proper channel operation is consistent with the guidance of IEEE 279-1968.

The CHANNEL CALIBRATION is defined as:

> A CHANNEL CALIBRATION shall be the adjustment, as necessary, of the channel output such that it responds within the necessary range and accuracy to known values of the parameter that the channel monitors. The CHANNEL CALIBRATION shall encompass all the devices in the channel required for channel OPERABILITY and the CHANNEL FUNCTIONAL TEST. Calibration of instrument channels with resistance temperature detector (RTD) or thermocouple sensors may consist of an inplace qualitative

> assessment of sensor behavior and normal calibration of the remaining adjustable devices in the channel. The CHANNEL CALIBRATION may be performed by means of any series of sequential, overlapping, or total channel steps.

As described in Section 3.1, the preamplifier has no test jacks to perform online testing. The component is tested prior to its installation. The gain link is set after installation to ensure the proper pulse height is present at the count rate amplifier. After that point, the gain link is not adjusted unless required due to detector replacement, subsequent detector setting changes during the life of the detector, or a preamplifier replacement. Similar to the RTD aspect of the above definition, the operation of the preamplifier is verified by the performance of a qualitative assessment of the instrument channel output, with the remaining adjustable devices (count rate amplifier and rate of change amplifier) of the channel receiving a normal calibration. The channel test module is used to calibrate the count rate and rate of change amplifiers.

The qualitative assessment for the preamplifier is accomplished by the performance of the channel check. The test procedure that implements the channel checks requires the count rate between the source range neutron flux channels to be within 0.5 decades of each other during Modes 2, 3, 4, 5, and 6.

During startup conditions when transitioning between the source range and the intermediate range, overlap between the intermediate range neutron flux instrument channels and the source range neutron flux instrument channel is verified in accordance with the DBNPS Technical Requirements Manual requirements. This overlap provides another indication of the correct operation of the source range neutron flux instrument channels.

Comparison with the output of the PAM neutron flux (source range) instrument channels, which are operable during Modes 1, 2, 3, and 6, also provides an additional indication of the correct operation of the source range neutron flux instrument channels.

If a preamplifier would need to be tested after installation, the testing activity would involve disconnection of the preamplifier's signal and power cabling, connection of test equipment to the preamplifier, and evaluating the output of the test equipment. Once the testing has been completed and the cabling reconnected, to confirm the cabling was reconnected properly, the channel indications would have to be compared with other plant indications to ensure the channel is functioning properly.

Instrument cabling and connector problems are known to induce noise or spiking in the instrument channels. Since this testing involves the disconnection and re-connection of cabling, the potential for these problems is created. Additionally, DBNPS uses a 24 month fuel cycle. Since SR 3.3.9.2.has an 18 month frequency, this testing could need to be performed during Mode 1, in order to ensure the channel is operable prior to entering Mode 2. If performed during Mode 1, the channel comparison cannot be performed until the reactor power is in the source range since the channels would be inoperable due to the source range neutron flux instrument channel high-voltage cut off function in the intermediate and power ranges. Hence, assurance of channel operation would be delayed until the channel verification is performed.

A malfunction of the preamplifier would be evident during normal operation by observing the channel response and indication while the instrument channel is in service. Performance of intrusive testing of the preamplifier would provide minimal benefit at the risk of introducing noise or a high resistance connection at the preamplifier connectors.

3.3 Failure Mode Analysis

A Failure Mode Analysis was performed for the source range neutron flux instrument channel preamplifier. The analysis indicates that preamplifier failures or degradation would be identified by channel checks or by routine system performance monitoring. The analysis also considered the misadjustment of the preamplifier gain link during replacement of a neutron detector or a preamplifier. This issue would be identified during performance of an alignment procedure. Once the gain link is set, it is held in place by screws. Therefore, this is not considered a credible event.

3.4 Updated Final Safety Analysis Report

UFSAR Section 7.8.1, "Nuclear Instrumentation Description," states that control rod withdrawal is inhibited by high startup rates detected by the source range neutron flux instrument channel. However, the functioning of this inhibit is not assumed in any accident analysis. UFSAR Section 15.2.1, "Uncontrolled Control Rod Assembly Group Withdrawal From a Subcritical Condition (Startup Accident)," states that a high startup rate withdrawal stop and alarm are provided in the source range to minimize the possibility of inadvertent continuous rod withdrawal and limit the potential excursions. The UFSAR section also states that even though the high startup rate withdrawal stop and alarm are available, they are not used in any accident analysis. Since the control rod inhibit function is not used in the accident analysis, the source range neutron flux instrument channel is not assumed to have a protection function. It merely serves as a means of indication.

3.5 Risk Evaluation

The source range neutron flux instrument channels are not modeled in the Level 1 Probabilistic Risk Assessment (PRA), the Shutdown PRA, or the Safety Monitor software. The source range neutron flux instrument channels are not risk significant.

3.6 Conclusion

Based on the source range neutron flux instrument channels redundancy and independence, credible failure modes of the preamplifier would be identified during the performance of channel checks or routine system performance monitoring, and with the availability of additional equipment to provide source range indication for comparison purposes, the proper operation of the source range neutron flux instrument channels can be assured without the need to include the preamplifier in the channel calibration test.

4.0 REGULATORY EVALUATION

The FirstEnergy Nuclear Operating Company (FENOC) requests Nuclear Regulatory Commission (NRC) review and approval of an amendment to the Davis-Besse Nuclear Power Station (DBNPS) Technical Specifications (TS).

The proposed amendment would exclude the source range neutron flux instrument channel preamplifier from the CHANNEL CALIBRATION requirements of TS 3.3.9, "Source Range Neutron Flux," and TS 3.9.2, "Nuclear Instrumentation."

4.1 Significant Hazards Consideration

FENOC has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below.

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No.

The proposed TS change excludes the source range neutron flux instrument channel preamplifier from the CHANNEL CALIBRATION requirements for the source range neutron flux instrument channel. The source range neutron flux instrument channels are not involved in accident mitigation. The failure of a source range neutron flux channel does not initiate an accident or transient event. The proposed TS change does not alter the design or function of the

source range neutron flux instrument channels, since no physical changes are being made to the plant. The availability of additional equipment to provide source range indication for comparison with the source range neutron flux instrument channels provides assurance of channel operation.

Therefore, the proposed TS change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The proposed TS change excludes the source range neutron flux instrument channel preamplifier from the CHANNEL CALIBRATION requirements for the source range neutron flux instrument channel. Based upon the current channel testing performed and the availability of alternate source range neutron flux indication for comparison, the operation of the source range neutron flux instrument channel is assured. The proposed TS change does not introduce any failure mechanisms of a different type than those previously evaluated since no physical changes to the plant are being made. No new or different equipment is being installed, and no installed equipment is being operated in a different manner.

Therefore, the proposed TS change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No.

The proposed TS change excludes the source range neutron flux instrument channel preamplifier from the CHANNEL CALIBRATION requirements for the source range neutron flux instrument channel. Based upon the current channel testing performed and the availability of alternate source range neutron flux indication for comparison, the operation of the source range neutron flux instrument channel is assured. The proposed TS change does not alter the design or function of the source range neutron flux instrument channels since no physical changes are being made to the plant.

Therefore, the proposed TS change does not involve a significant reduction in a margin of safety.

Based on the above, FENOC concludes that the proposed amendment does not involve a 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.

4.2 Applicable Regulatory Requirements/Criteria

The following paragraphs describe relevant regulatory requirements associated with the proposed TS change.

General Design Criterion 13, "Instrumentation and control"

The criterion requires instruments 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. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges.

The two redundant and independent source range neutron flux instrument channels provide reactor core neutron flux monitoring throughout the source range and into the lower end of the intermediate range. The source range neutron flux instrument channels have no safety function and are not assumed to function during any Updated Final Safety Analysis Report (UFSAR) design basis accident or transient analysis. The proposed TS change does not alter the design or operation of the instrument channels. The instrument channels will continue to monitor neutron flux in the source range. Therefore, the criterion is satisfied.

10 CFR 50.36(c)(3), "Surveillance requirements"

The 10 CFR 50.36(c)(3) requirements are related to testing, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met.

As a result of the proposed TS change, the operation of the source range neutron flux instrument channel preamplifier will be verified by the performance of a qualitative assessment of the instrument channel output through the use of a channel check as a surveillance requirement on a 12-hour frequency for the Modes of applicability. The operation of the instrument channel count rate amplifier and rate of change amplifier will

continue to be verified by channel calibration on an 18-month frequency for the Modes of applicability. Therefore, these testing requirements will be used to satisfy 10 CFR 50.36(c)(3).

4.3 Precedent

No amendment requests similar to this request have been identified.

4.4 Conclusions

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 Nuclear Regulatory Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to 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, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in 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), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 REFERENCES

1. UFSAR Section 7.8.1, "Nuclear Instrumentation Description"

2. UFSAR Section 15.2.1, "Uncontrolled Control Rod Assembly Group Withdrawal From a Subcritical Condition (Startup Accident)"

3. IEEE 279-1968, "Proposed IEEE Criteria for Nuclear Power Plant Protection Systems"

Attachment 1
L-09-143

Proposed Technical Specification Changes (Mark Up)

(Four Pages Included)

NO CHANGE PROPOSED, INCLUDED FOR CONTEXT.

3.3 INSTRUMENTATION

3.3.9 Source Range Neutron Flux

LCO 3.3.9 Two source range neutron flux channels shall be OPERABLE.

---NOTE---
High voltage to detector may be de-energized with neutron flux > 1E-10 amp on intermediate range channels.

APPLICABILITY: MODES 2, 3, 4, and 5.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One source range neutron flux channel inoperable with neutron flux ≤ 1E-10 amp on the intermediate range neutron flux channels.	A.1 Restore channel to OPERABLE status.	Prior to increasing neutron flux
B. Two source range neutron flux channels inoperable with neutron flux ≤ 1E-10 amp on the intermediate range neutron flux channels.	B.1 ---NOTE--- Plant temperature changes are allowed provided the temperature change is accounted for in the calculated SDM. --- Suspend operations involving positive reactivity changes.	Immediately
	AND	
	B.2 Initiate action to insert all CONTROL RODS.	Immediately
	AND	

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.3 Open CONTROL ROD drive trip breakers. AND B.4 Verify SDM is within the limits specified in the COLR.	1 hour 1 hour AND Once per 12 hours thereafter
C. One or more source range neutron flux channels inoperable with neutron flux > 1E-10 amp on the intermediate range neutron flux channels.	C.1 Initiate action to restore affected channel(s) to OPERABLE status.	1 hour

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.9.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.9.2	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	 18 months

and preamplifiers

NO CHANGE PROPOSED.
INCLUDED FOR CONTEXT.

3.9 REFUELING OPERATIONS

3.9.2 Nuclear Instrumentation

LCO 3.9.2 Two source range neutron flux monitors shall be OPERABLE.

APPLICABILITY: MODE 6.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One required source range neutron flux monitor inoperable.	A.1	Suspend positive reactivity additions, except the introduction of coolant into the RCS.	Immediately
	AND		
	A.2	Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet the boron concentration of LCO 3.9.1.	Immediately
B. Two required source range neutron flux monitors inoperable.	B.1	Initiate action to restore one source range neutron flux monitor to OPERABLE status.	Immediately
	AND		
	B.2	Perform SR 3.9.1.1.	Once per 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.9.2.1	Perform CHANNEL CHECK.	12 hours
SR 3.9.2.2	NOTE 1. Neutron detectors are excluded from CHANNEL CALIBRATION. Perform CHANNEL CALIBRATION.	18 months

2. For the source range neutron flux channels, the preamplifiers are also excluded from CHANNEL CALIBRATION.

Attachment 2
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Proposed Technical Specification Changes
(Re-typed – For Information Only)

(Two Pages Included)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.3 Open CONTROL ROD drive trip breakers. AND B.4 Verify SDM is within the limits specified in the COLR.	1 hour 1 hour AND Once per 12 hours thereafter
C. One or more source range neutron flux channels inoperable with neutron flux > 1E-10 amp on the intermediate range neutron flux channels.	C.1 Initiate action to restore affected channel(s) to OPERABLE status.	1 hour

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.9.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.9.2	----------NOTE---------- Neutron detectors and preamplifiers are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	 18 months

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.9.2.1	Perform CHANNEL CHECK.	12 hours
SR 3.9.2.2	----------NOTES---------- 1. Neutron detectors are excluded from CHANNEL CALIBRATION. 2. For the source range neutron flux channels, the preamplifiers are also excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION.	18 months

Attachment 3
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Proposed Technical Specification Bases Changes (For Information Only)

(Nine Pages Included)

INFORMATION ONLY

NO CHANGES THIS PAGE.

B 3.3 INSTRUMENTATION

B 3.3.9 Source Range Neutron Flux

BASES

BACKGROUND

The Reactor Protection System (RPS) source range neutron flux channels provide the operator with an indication of the approach to criticality at lower power levels than can be seen on the intermediate range neutron flux instrumentation. These channels also provide the operator with a flux indication that reveals changes in reactivity and helps to verify that SDM is being maintained.

The source range instrumentation has two redundant count rate channels originating in two high sensitivity proportional counters. Two source range detectors are externally located on opposite sides of the core 180°. These channels are used over a counting range of 0.1 cps to 1E6 cps and are displayed on the operator's control console in terms of log count rate. The channels also measure the rate of change of the neutron flux level, which is displayed for the operator in terms of startup rate from -0.5 decades to +5 decades per minute. An interlock provides a control rod withdraw "inhibit" on a high startup rate of +2 decades per minute in either channel.

The proportional counters of the source range channels are BF_3 chambers. The detector high voltage is automatically turned off when the flux level is approximately one decade above the useful operating range. Conversely, the high voltage is turned on automatically when the flux level returns to within approximately one decade of the detectors' maximum useful range. High voltage will be turned off automatically when the flux level is above 1E-9 amp in both intermediate range channels, or 10% power in power range channels (i.e., NI-5 or NI-6 and NI-7 or NI-8).

APPLICABLE SAFETY ANALYSES

The source range neutron flux channels are necessary to monitor core reactivity changes. It is the primary means for detecting and triggering operator actions to respond to reactivity transients initiated from conditions in which the Reactor Protection System (RPS) is not required to be OPERABLE. It also triggers operator actions to anticipate RPS actuation in the event of reactivity transients during startup and shutdown conditions. However, the source range neutron flux channels are not credited in the safety analysis.

The source range neutron flux channels have no safety function and are not assumed to function during any UFSAR design basis accident or transient analysis. However, the source range neutron flux channels provide on scale monitoring of neutron flux levels during startup and shutdown conditions. Therefore, they are being retained in Technical Specifications.

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BASES

LCO

Two source range neutron flux channels (i.e., the channels associated with the RPS) shall be OPERABLE whenever the control rods are capable of being withdrawn to provide the operator with redundant source range neutron instrumentation. The source range instrumentation is the primary power indication at low power levels ≤ 1E-10 amp on intermediate range instrumentation and must remain OPERABLE for the operator to continue increasing power.

A Note has been added allowing detector high voltage to be de-energized with neutron flux > 1E-10 amp on the intermediate range channels. Above this point, the source range instrumentation is no longer the primary power indicator. As such, the high voltage to the source range detectors may be de-energized.

APPLICABILITY

Two source range neutron flux channels shall be OPERABLE in MODE 2 to provide redundant indication during an approach to criticality. Neutron flux level is sufficient for monitoring on the intermediate range and on the power range instrumentation prior to entering MODE 1; therefore, source range instrumentation is not required in MODE 1.

In MODES 3, 4, and 5, source range neutron flux instrumentation shall be OPERABLE to provide the operator with a means of monitoring changes in SDM and to provide an early indication of reactivity changes.

The requirements for source range neutron flux instrumentation during MODE 6 refueling operations are addressed in LCO 3.9.2, "Nuclear Instrumentation."

ACTIONS

A.1

The Required Action for one channel of the source range neutron flux indication inoperable with neutron flux ≤ 1E-10 amp on the intermediate range neutron flux instrumentation is to delay increasing reactor power until the channel is repaired and restored to OPERABLE status. This limits power increases in the range where the operators rely solely on the source range instrumentation for power indication. The Completion Time ensures the source range is available prior to further power increases.

B.1, B.2, B.3, and B.4

With both source range neutron flux channels inoperable with neutron flux ≤ 1E-10 amp on the intermediate range neutron flux instrumentation, the operators must take actions to limit the possibilities for adding positive reactivity and to verify adequate SDM. This is done by immediately suspending positive reactivity additions, initiating action to insert all

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NO CHANGES THIS PAGE.

BASES

ACTIONS

B.1, B.2, B.3, and B.4 (continued)

CONTROL RODS, and opening the CONTROL ROD drive trip breakers and verifying SDM is within limit within 1 hour. Periodic SDM verification is then required to provide a means for detecting the slow reactivity changes that could be caused by mechanisms other than control rod withdrawal or operations involving positive reactivity changes. Since the source range instrumentation provides the only reliable direct indication of power in this condition, the operators must continue to verify the SDM every 12 hours until at least one channel of the source range instrumentation is returned to OPERABLE status. Required Action B.1, Required Action B.2, and Required Action B.3 preclude rapid positive reactivity additions. The 1 hour Completion Time for Required Action B.3 and Required Action B.4 provides sufficient time for operators to accomplish the actions. The 12 hour Frequency for performing the SDM verification ensures that the reactivity changes possible with CONTROL RODS inserted are detected before SDM limits are challenged.

Required Action B.1 is modified by a Note which permits plant temperature changes provided the temperature change is accounted for in the calculated SDM. Introduction of temperature changes, including temperature increases when a positive MTC exists, must be evaluated to ensure they do not result in a loss of required SDM.

C.1

With neutron flux > 1E-10 amp on the intermediate range neutron flux instrumentation, continued operation is allowed with one or more source range neutron flux channels inoperable. The ability to continue operation is justified because the instrumentation does not provide a safety function during high power operation. However, actions are initiated within 1 hour to restore the channel(s) to OPERABLE status for future availability. The Completion Time of 1 hour is sufficient to initiate the action. The action must continue until channels are restored to OPERABLE status.

SURVEILLANCE REQUIREMENTS

SR 3.3.9.1

Performance of the CHANNEL CHECK once every 12 hours ensures that a gross failure of instrumentation has not occurred. A CHANNEL CHECK is normally a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between the two instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. CHANNEL

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BASES

SURVEILLANCE REQUIREMENTS

SR 3.3.9.1 (continued)

CHECK will detect gross channel failure; therefore, it is key in verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the unit staff, based on a combination of the channel instrument uncertainties, including isolation, indication, and readability. If a channel is outside the criteria, it may be an indication that the detector or the signal processing equipment has drifted outside its limit. If the channels are within the criteria, it is an indication that the channels are OPERABLE. If the channels are normally off scale during times when surveillance is required, the CHANNEL CHECK will only verify that they are off scale in the same direction. Off scale low current loop channels are verified to be reading at the bottom of the range and not failed downscale.

The Frequency, 12 hours, is based on operating experience that demonstrates channel failure is rare. Since the probability of two random failures in redundant channels in any 12 hour period is extremely low, the CHANNEL CHECK minimizes the chance of loss of protective function due to failure of redundant channels. The CHANNEL CHECK supplements less formal, but more frequent, checks of channel OPERABILITY during normal operational use of the displays associated with the LCO's required channels. When operating in Required Action A.1, CHANNEL CHECK is still required. However, in this condition, a redundant source range is not available for comparison. CHANNEL CHECK may still be performed via comparison with Post Accident Monitoring source range detectors, if available, and verification that the OPERABLE source range channel is energized and indicating a value consistent with current unit status.

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BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.3.9.2

For source range neutron flux channels, CHANNEL CALIBRATION is a complete check and readjustment of the channels from the ~~preamplifier~~ COUNT RATE AMPLIFIER input to the indicators. This test verifies the channel responds to measured parameters within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drift to ensure that the instrument channel remains operational between successive tests.

The SR is modified by a Note excluding neutron detectors AND PREAMPLIFIERS from CHANNEL CALIBRATION. It is not necessary to test the detectors AND THE PREAMPLIFIERS because generating a meaningful test signal is difficult. ~~The detectors are of simple construction, and~~ any failures in the detectors OR PREAMPLIFIERS will be apparent as a change in channel output.

The Frequency of 18 months is based on demonstrated instrument CHANNEL CALIBRATION reliability over an 18 month interval, such that the instrument is not adversely affected by drift.

REFERENCES None.

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B 3.9 REFUELING OPERATIONS

B 3.9.2 Nuclear Instrumentation

BASES

BACKGROUND

The source range neutron flux monitors are used during refueling operations to monitor the core reactivity condition. The installed source range neutron flux monitors are part of the Reactor Protection System (RPS) and Post Accident Monitoring (PAM) Instrumentation. These detectors are located external to the reactor vessel and detect neutrons leaking from the core. The use of portable detectors is permitted, provided the LCO requirements are met.

The installed RPS source range neutron flux monitors are two high sensitivity proportional counters (BF_3 chambers). The detectors monitor the neutron flux in counts per second. The instrument range covers seven decades of neutron flux (1E-1 cps to 1E+6 cps). The detectors also provide continuous visual indication in the control room to alert operators to a possible dilution accident. The RPS is designed in accordance with the criteria presented in Reference 1. The installed PAM monitors are two safety grade electrically and physically independent fission chamber strings. The channel 1 PAM detector (NI5874A) is located near the corresponding channel 1 RPS detector (NI-2) and the channel 2 PAM detector (NI5875A) is located adjacent to the corresponding channel 2 RPS detector (NI-1). The detectors monitor the neutron flux in counts per second. The PAM instrument range covers six decades of neutron flux (1E-1 cps to 1E+5 cps). The detectors also provide continuous visual indication in the control room and an audible indication to alert operators. If used, portable detectors should be functionally equivalent to the installed source range monitors.

APPLICABLE SAFETY ANALYSES

Two OPERABLE source range neutron flux monitors are required to provide a signal to alert the operator to unexpected changes in core reactivity, such as by a boron dilution accident. The safety analysis of the boron dilution accident is described in Reference 2. The analysis of the boron dilution accident shows that the normally available SDM would not be lost, and there is sufficient time for the operator to take corrective action.

The source range neutron flux monitors have no safety function are not assumed to function during any UFSAR design basis accident or transient analysis. However, the source range neutron channels provide on scale monitoring of neutron flux levels during refueling conditions. Therefore, they are being retained in Technical Specifications.

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BASES

LCO

This LCO requires two source range neutron flux monitors to be OPERABLE to ensure that redundant monitoring capability is available to detect changes in core reactivity. To be OPERABLE, each monitor must provide continuous visual indication in the control room, and one monitor must provide audible indication in the containment and the control room.

APPLICABILITY

In MODE 6, the source range neutron flux monitors must be OPERABLE to determine changes in core reactivity. There is no other direct means available to check core reactivity levels. In MODES 2, 3, 4, and 5, these same installed RPS source range detectors and circuitry are also required to be OPERABLE by LCO 3.3.9, "Source Range Neutron Flux." In MODES 1, 2, and 3, these same installed PAM source range detectors and circuitry are also required to be OPERABLE by LCO 3.3.17, "Post Accident Monitoring (PAM) Instrumentation."

ACTIONS

A.1 and A.2

With only one required source range neutron flux monitor OPERABLE, redundancy has been lost. Since these instruments are the only direct means of monitoring core reactivity conditions, positive reactivity additions and introduction of coolant into the RCS with boron concentration less than required to meet the minimum boron concentration of LCO 3.9.1 must be suspended immediately. Suspending positive reactivity additions that could result in failure to meet the minimum boron concentration limit is required to assure continued safe operation. Introduction of coolant inventory must be from sources that have a boron concentration greater than what would be required in the RCS for minimum refueling boron concentration. This may result in an overall reduction in RCS boron concentration, but provides acceptable margin to maintaining subcritical operation. Performance of Required Action A.1 shall not preclude completion of movement of a component to a safe position.

B.1

With no required source range neutron flux monitor OPERABLE, action to restore a monitor to OPERABLE status shall be initiated immediately. Once initiated, action shall be continued until a source range neutron flux monitor is restored to OPERABLE status.

B.2

With no required source range neutron flux monitor OPERABLE, there is no direct means of detecting changes in core reactivity. However, since positive reactivity additions are not to be made, the core reactivity

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BASES

ACTIONS

B.2 (continued)

condition is stabilized until the source range neutron flux monitors are OPERABLE. This stabilized condition is determined by performing SR 3.9.1.1 to ensure that the required boron concentration exists.

The Completion Time of once per 12 hours is sufficient to obtain and analyze a reactor coolant sample for boron concentration and ensures that unplanned changes in boron concentration would be identified. The 12 hour Frequency is reasonable, considering the low probability of a change in core reactivity during this time period.

SURVEILLANCE REQUIREMENTS

SR 3.9.2.1

SR 3.9.2.1 is the performance of a CHANNEL CHECK, which is a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that the two indication channels should be consistent with core conditions. Changes in fuel loading and core geometry can result in significant differences between source range channels, but each channel should be consistent with its local conditions.

The Frequency of 12 hours is consistent with the CHANNEL CHECK Frequency specified similarly for the same instruments in LCO 3.3.9.

SR 3.9.2.2

NEUTRON FLUX

SR 3.9.2.2 is the performance of a CHANNEL CALIBRATION every 18 months. This SR is modified by ~~a Note stating that neutron detectors are excluded from the CHANNEL CALIBRATION.~~ The CHANNEL CALIBRATION for the ~~RPS~~ source range channel is a complete check and re-adjustment of the channels, from the ~~preamplifier input~~ to the indicators, and for the PAM source range channels is a complete check of the instrument channel. Operating experience has shown these components usually pass the Surveillance when performed at the 18 month Frequency.

COUNT RATE AMPLIFIER

TWO NOTES. NOTE 1 EXCLUDES THE NEUTRON DETECTORS FROM CHANNEL CALIBRATION. NOTE 1 APPLIES TO BOTH THE SOURCE RANGE NEUTRON FLUX CHANNELS AND THE PAM SOURCE RANGE CHANNELS. NOTE 2 EXCLUDES THE SOURCE RANGE NEUTRON FLUX CHANNEL PREAMPLIFIER FROM THE CHANNEL CALIBRATION.

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BASES

REFERENCES

1. UFSAR, Appendices 3D.1.9, Criterion 13 – Instrumentation and Control; 3D.1.16, Criterion 20 – Protection Systems Functions; 3D.1.17, Criterion 21 – Protection System Reliability and Testability; 3D.1.18, Criterion 22 – Protection System Independence; 3D.1.19, Criterion 23 – Protection System Failure Modes; 3D.1.20, Criterion 24 – Separation of Protection and Control Systems; and 3D.1.25, Criterion 29 – Protection Against Anticipated Operational Occurrences.

2. UFSAR, Section 15.2.4 and Appendix 4B.