RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**439-8524**
SRP Section:	**16 – Technical Specifications**
Application Section:	**16.3.1**
Date of RAI Issue:	**03/11/2016**

Question No. 16-125

In LCO 3.1.~~12~~11, "Special Test Exceptions (STE) – Reactivity Coefficient Testing," the applicant is requested to replace the last phrase "limits specified in their LCOs" with:

> "... may be suspended, provided **Linear Heat Rate** (LHR) and **Departure from Nucleate Boiling Ratio** (DNBR) do not exceed the limits specified in: ~~their LCOs.~~
>
> **LCO 3.2.1, "Linear Heat Rate (LHR)"; and**
> **LCO 3.2.4, "Departure from Nucleate Boiling Ratio (DNBR)."**

With the above change to the LCO statement, Condition A can be simplified as indicated: "LHR or DNBR outside ~~the~~ limits ~~specified in their LCOs~~.

The Frequency of SR 3.1.11.1 is "Continuously," which is impractical if COLSS is out of service. It should be replaced by a short time interval that is greater than the typical time needed to perform SR 3.2.1.1 (Verify LHR, as indicated on each OPERABLE local power density channel, is within its limit. | 2 hours) and SR 3.2.4.1 (Verify DNBR, as indicated on all OPERABLE DNBR channels, is within limit of Figure 3.2.4-2 or 3.2.4-3 of COLR, as applicable. | 2 hours). Each of these surveillances is only applicable when COLSS is not monitoring parameters (out of service), because COLSS monitors LHR and DNBR continuously. Also, if just one of the four LHR and DNBR channels is operable with COLSS out of service, can the LHR and DNBR verifications required by SR 3.1.11.1 by performing SR 3.2.1.1 and SR 3.2.4.1 be met?

In addition, The LCO section of the Bases for Subsection 3.1.11 says "The requirements of LCOs 3.1.7, 3.1.8 and 3.4.1 (for RCS cold leg temperature only) may be suspended during the performance of PHYSICS TESTS *provided COLSS is in service*." The Notes in SR 3.2.1.1 for LHR verification and SR 3.2.4.1 for DNBR verification say that these verifications are not required to be met if COLSS is in service. Therefore, this Bases statement renders SR 3.1.11.1 ambiguous. Staff suggests that reference to SR 3.2.1.1 and SR 3.2.4.1 not be used; rather SR 3.1.11.1 should be self-contained. For example:

	SURVEILLANCE	FREQUENCY
SR 3.1.**11**.1	----------NOTE---------- Only required to be met when COLSS is out of service. With COLSS in service, LHR is continuously monitored. ---------- Verify LHR, as indicated on each OPERABLE **Core Protection Calculator** local power density channel, is within ~~its~~ **the** limit **specified in the COLR.**	15 minutes
SR 3.1.**11**.2	----------NOTE---------- Only required to be met when COLSS is out of service. With COLSS in service, DNBR is continuously monitored. ---------- Verify DNBR, as indicated on all OPERABLE **Core Protection Calculator** DNBR channels, is within **the** limit**s** of Figure 3.2.4-2 or **Figure** 3.2.4-3 of **the** COLR, as applicable.	15 minutes

These SRs seem ambiguous. Consider whether the high-lighted words “each” and “all” can be replaced by “one or more”; or “each” can be replaced by “all”; or “all” replaced by “each.”

The 15 minute Frequency is a suggestion based on the 15 minute Completion Time of Required Action B.1 of Specifications 3.2.1 and 3.2.4.

Conforming changes to the Bases for Specifications 3.1.**11**, 3.2.1, and 3.2.4 should also be made.

Response

The last phrase of LCO 3.1.12 (Special Test Exceptions (STE) – Reactivity Coefficient Testing) “may be suspended, provided LHR and DNBR do not exceed the limits specified in their LCOs” will be revised to spell out the acronyms and to specify the associated LCOs that are applicable.

The originally specified surveillance 3.1.12.1 reflected the use of the COLSS which continuously monitors LHR and DNBR. When COLSS is not available, the core protection calculator (CPC) channel should be used to verify that the LHR and DNBR are within the limits specified in the COLR. Therefore, the surveillance requirement will be changed to consider the conditions when COLSS is in the out-of-service condition. The surveillance frequency will be changed to the more appropriate period of 15 minutes when the COLSS is not available. The 15-minute frequency is adequate to allow the operator to monitor the LHR and DNBR with the CPC. This frequency is also consistent with Actions B.1 of LCO 3.2.1 and LCO 3.2.4. Also, a surveillance

requirement, 3.1.12.2, will be added to address the LHR and DNBR surveillances separately.

The LCO 3.3.1 defines the conditions for operation of the Reactor Protection System (RPS). According to LCO 3.3.1, having only one operable LHR or DNBR channel is not acceptable. The pre-requisite for reactivity coefficient testing requires that all CPC channels be operable and the COLSS be in service.

SRs 3.2.1.1, 3.2.4.1 and the Bases of SR 3.2.1.1 will be revised to align the terminology in the operable channels to consistently refer to any channels which is consistent with the STS and with the previous response provided to RAI 295-8263 Question16-109.

Impact on DCD

Same as changes described in Impact on Technical Specifications section.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

LCOs 3.1.12, 3.2.1 and 3.2.4 will be revised along with the Bases for 3.1.12 and 3.2.1.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

3.1 REACTIVITY CONTROL SYSTEMS

3.1.12 Special Test Exceptions (STE) – Reactivity Coefficient Testing

LCO 3.1.12 During performance of PHYSICS TESTS, the requirements of:

LCO 3.1.7, "Regulating Control Element Assembly (CEA) Insertion Limits"
LCO 3.1.8, "Part Strength CEA Insertion Limits"
LCO 3.4.1, "RCS Pressure, Temperature and Flow limits" (LCO 3.4.1.b, RCS Cold Leg Temperature only)

~~may be suspended, provided LHR and DNBR do not exceed the limits specified in their LCOs.~~

may be suspended, provided Linear Heat Rate (LHR) and Departure from Nucleate Boiling Ratio (DNBR) do not exceed the limits specified in:

LCO 3.2.1, "Linear Heat Rate (LHR)"; and
LCO 3.2.4, "Departure from Nucleate Boiling Ratio (DNBR).

Insert

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. LHR or DNBR outside ~~the~~ limits ~~specified in their LCOs~~.	A.1 Reduce THERMAL POWER to restore LHR and DNBR to within limits.	15 minutes
B. Required Action and associated Completion Time not met.	B.1 Suspend PHYSICS TESTS.	1 hour

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.1.12.1	Verify LHR and DNBR do ~~not exceed~~ limits by performing ~~SR~~ 3.2.1.1 and SR 3.2.4.1.	Continuously

Replace with revised SR 3.1.12.1 on following page and add new 3.1.12.2.

SURVEILLANCE		FREQUENCY
SR 3.1.12.1	----------NOTE---------- Only required to be performed when COLSS is out of service. With COLSS in service, LHR is continuously monitored. ---------- Verify LHR, as indicated on any OPERABLE Core Protection Calculator local power density channel, is within the limit specified in the COLR.	15 minutes
SR 3.1.12.2	----------NOTE---------- Only required to be performed when COLSS is out of service. With COLSS in service, DNBR is continuously monitored. ---------- Verify DNBR, as indicated on any OPERABLE Core Protection Calculator DNBR channels, is within the limits of Figure 3.2.4-2 or Figure 3.2.4-3 of the COLR, as applicable.	15 minutes

BASES

LCO

This LCO permits Part Strength CEAs and Regulating CEAs to be positioned outside of their normal group heights and insertion limits, and RCS cold leg temperature to be outside its limits during the performance of PHYSICS TESTS. These PHYSICS TESTS are required to determine the isothermal temperature coefficient (ITC), MTC, and power coefficient.

CS cold leg
nance of

VER greater than
MAL POWER
TESTS described

ir LCOs,
be reduced to
ompletion Time
LHR or DNBR to

within the

SR 3.1.12.1

With THERMAL POWER greater than or equal to 20% RTP, LHR can be continuously monitored using the COLSS since the COLSS is available with THERMAL POWER above 20% RTP. If COLSS is not available, the operator must monitor the LHR using any OPERABLE CPC channel to verify that the LHR is within the specified limit in the COLR. A 15-minute Frequency is adequate to allow the operator to identify trends that would result in an approach to the LHR limit.

SR 3.1.12.2

With THERMAL POWER greater than or equal to 20% RTP, DNBR can be continuously monitored using the COLSS since the COLSS is available with THERMAL POWER above 20% RTP. If COLSS is not available, the operator must monitor the DNBR using any OPERABLE CPC channel to verify that the DNBR is within the limits of Figure 3.2.4-2 or Figure 3.2.4-3 of the COLR, as applicable. A 15-minute Frequency is adequate to allow the operator to identify trends in conditions that would result in an approach to the DNBR limit.

required Completion Time, PHYSICS TESTS must be suspended within 1 hour. Allowing 1 hour for suspending PHYSICS TESTS allows the operator sufficient time to change any abnormal conditions back to within the limits of LCOs 3.1.7, 3.1.8, and 3.4.1 (for RCS cold leg temperature only). During suspending PHYSICS TEST STE, the corresponding LCOs shall be restored.

SURVEILLANCE REQUIREMENTS

~~SR 3.1.12.1~~

~~With THERMAL POWER greater than or equal to 20 % RTP, LHR and DNBR can be continuously monitored using the COLSS since the COLSS is available with THERMAL POWER above 20 % RTP. If COLSS is not available, LHR and DNBR can be continuously monitored using any OPERABLE CPC channel. Continuous monitoring is required to ensure that the LHR and DNBR limits are satisfied at all times. SRs 3.2.1.1 and 3.2.4.1 provide the specific requirements for performing this SR.~~

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.2.1.1	---------- NOTE ---------- Only required to be met when COLSS is out of service. With COLSS in service, LHR is continuously monitored. ---------- Verify LHR, as indicated on ~~each~~ any OPERABLE local power density channel, is within its limit.	2 hours
SR 3.2.1.2	Verify COLSS margin alarm actuates at a THERMAL POWER equal to or less than the core power operating limit based on LHR.	31 days

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. DNBR outside the region of acceptable operation when COLSS is out of service.	B.1 Determine trend in DNBR. AND B.2.1 With an adverse trend, restore DNBR to within limit. OR B.2.2 With no adverse trend, restore DNBR to within limit.	Once per 15 minutes 1 hour 4 hours
C. Required Action and associated Completion Time not met.	C.1 Reduce THERMAL POWER to ≤ 20 % RTP.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.2.4.1	---------- NOTE ---------- Only applicable when COLSS is out of service. With COLSS in service, this parameter is continuously monitored. ---------- Verify DNBR, as indicated on ~~all~~ any OPERABLE DNBR channels, is within limit of Figure 3.2.4-2 or 3.2.4-3 of COLR, as applicable.	2 hours
SR 3.2.4.2	Verify COLSS margin alarm actuates at a THERMAL POWER level equal to or less than core power operating limit based on DNBR.	31 days

BASES

SURVEILLANCE REQUIREMENTS

SR 3.2.1.1

With the COLSS out of service, the operator must monitor the LHR with any ~~each~~ OPERABLE local power density channel.

A 2-hour Frequency is sufficient to allow the operator to identify trends that would result in an approach to the LHR limits.

This SR is modified by a Note that states that the SR is applicable only when the COLSS is out of service. Continuous monitoring of the LHR is provided by the COLSS, which calculates core power and core power operating limits based on the LHR and continuously displays these limits to the operator. A COLSS margin alarm is annunciated in the event that the THERMAL POWER exceeds the core power operating limit based on LHR.

SR 3.2.1.2

Verification that the COLSS margin alarm actuates at a THERMAL POWER level equal to or less than the core power operating limit based on the LHR (W/cm) ensures the operator is alerted when conditions approach the LHR operating limit.

The 31-day Frequency for performance of this SR is consistent with the historical testing Frequency of reactor protection and monitoring systems.

REFERENCES

1. DCD Tier 2, Chapter 15.
2. DCD Tier 2, Chapter 6.
3. APR1400-F-C-TR-12002-P, Rev. 0, "KCE-1 Critical Heat Flux Correlation for PLUS7 Thermal Design," November 2012.
4. 10 CFR Part 50, Appendix A, GDC 10.
5. 10 CFR 50.46.
6. NUREG-0800, Rev. 3, March 2007.
7. 10 CFR Part 50, Appendix A, GDC 26.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**439-8524**
SRP Section:	**16 – Technical Specifications**
Application Section:	**16.3.1**
Date of RAI Issue:	**03/11/2016**

Question No. 16-126

On page 30, the (Dec 2015) Deviation Report justifies adding RPS Functions 3.3.1.2, 3.3.1.14, 3.3.1.15, and 3.3.2.1 to the list of excepted LCO requirements in DCD Revision 0, generic TS LCO 3.1.10, as follows:

> RPS bypass setpoint change was determined as a STE during a previous plant startup test. RPS bypass setpoint changes need to prevent unnecessary reactor trip by RPS during criticality test. The criticality test and related SR are added.

Applicant is requested to explain in more detail what this paragraph means.

1. Describe the changes to RPS bypass setpoints, and how that applies to including these Functions in the LCO 3.1.10 exception list;

2. Describe the issue related to the criticality test that lead to a need for RPS bypass setpoint changes;

3. Explain why APR1400 needs this exception while CE STS does not.

Response

1. The following bypass setpoints are changed during the criticality test and shutdown margin (SDM) test.

Trip parameters	Nominal bypass setpoints and bypass region	Changed values
High Logarithmic Power	> 10^{-3}%	> 10^{-4}%

High Local Power Density	< 10^{-4}%	< 5%
Low Departure from Nucleate Boiling Ratio		

Bypassing the above trips is to prevent unexpected reactor trips during the SDM test. The SDM test is performed at a critical condition before the point of addition heat (POAH). The power range for the test is normally from 10^{-4}% to 10^{-2}% of rated thermal power (RTP). The nominal high logarithmic power trip (HLPT) setpoint is 0.018% RTP, as indicated in DCD Tier 2 Table 7.2-4. This trip setpoint is very close to the test power range and, therefore, bypassing the HLPT is needed to prevent unexpected reactor trips. Having the nominal bypass setpoint within the test power range adds an unnecessary distraction to the test. When the power is decreased below 10^{-3}% RTP, the bypass is automatically removed. When the power is increased above 10^{-3}% RTP, operator action is needed to bypass the HLPT setpoint. The operator may miss a required action for the test due to the bypassing of the setpoint. Therefore, the bypass setpoint is changed to 10^{-4}% for test convenience.

The high local power density (LPD) and low departure from nucleate boiling ratio (DNBR) trips are generated in the core protection calculator (CPC). These CPC trip signals are generated when the shutdown CEA group is inserted or CEA sequencing is violated. Both of these conditions occur when performing control rod worth measurement during the SDM test. Therefore, the CPC trips should be bypassed during the test and the bypass setpoint is increased to 5% RTP.

2. There is no technical need to change the RPS bypass setpoint during the criticality test. The purpose of bypass setpoint change is to reduce the critical path of the reload startup sequences without compromising safety. Since the core is continuously monitored to estimate the criticality during the criticality test and is controlled administratively with the criticality test procedure, it is an acceptable condition to allow the bypass setpoint change.

3. The APR1400 TS does not have LCO 3.4.17 of the CE STS, which is a special test exception of the RCS loops. LCO 3.4.17 enables the natural circulation test at power (i.e., reactor critical with less than 5% power) and defines the RPS bypassing. The RPS bypassing defined in LCO 3.4.17 is not only for the natural circulation test, but also for other physic tests. The HLPT is normally bypassed at power and a special test exception is not needed for performing the natural circulation test at power. Adding the RPS bypassing in LCO 3.1.10 corresponded to having LCO 3.4.17 in the CE STS during the previous licensing process.

Impact on DCD

There is no impact on the DCD.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**439-8524**
SRP Section:	**16 – Technical Specifications**
Application Section:	**16.1.1**
Date of RAI Issue:	**03/11/2016**

Question No. 16-127

In the generic TS 1.1 definition of ESF Response Time, the STS 1.1 definition's phrase "((i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.)" is revised to say "(e.g., valves travel to their required positions, pump discharge pressures reach their required values)"; which has a different meaning. The applicant is requested to revise this definition to match the STS 1.1 definition.

The STS 1.1 definition of RPS Response Time ends with the sentence, "In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC." In the Dec. 2015 Deviation Report, on page 24, this sentence is described as being omitted from the generic TS definition because "APR1400 has no approved methodology." Since this sentence is included in both ESF and RPS Response Time definitions in the STS, regardless of the existence of any NRC approved methodology, the applicant is requested to include this phrase in the generic TS 1.1 definitions for ESF Response Time and RPS Response Time.

Response

The following changes will be made to the definition of Engineered Safety Feature (ESF) Response Time stated in the generic TS 1.1:

1. The statement "(e.g., valves travel to their required positions, pump discharge pressures reach their required values)" will be changed to "(i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.)."

2. The sentence "In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC" will be added to the definition of ESF

Response Time.

Impact on DCD

Same as changes described in the impact on Technical Specifications section.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

The TS 1.1 will be revised as indicated in the Attachment.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical or Environmental Report.

1.1 Definitions

DOSE EQUIVALENT I-131	DOSE EQUIVALENT I-131 shall be that concentration of I-131 (Bq/g) that alone would produce the same dose when inhaled as the combined activities of iodine isotopes I-131, I-132, I-133, I-134, and I-135 actually present. The determination of DOSE EQUIVALENT I-131 shall be performed using thyroid dose conversion factors from Table 2.1 of EPA Federal Guidance Report No. 11, "Limiting Values of Radionuclide Intake and Air Concentration and Dose Conversion Factors for Inhalation, Submersion, and Ingestion," EPA-520/1-88-020, September 1988.
DOSE EQUIVALENT XE-133	DOSE EQUIVALENT XE-133 shall be that concentration of Xe-133 (Bq/g) that alone would produce the same acute dose to the whole body as the combined activities of noble gas nuclides Kr-85m, Kr-85, Kr-87, Kr-88, Xe-131m, Xe-133m, Xe-133, Xe-135m, Xe-135 and Xe-138 actually present. The determination of DOSE EQUIVALENT Xe-133 shall be performed using effective dose conversion factors for air submersion listed in Table III.1 of EPA Federal Guidance Report No. 12, "External Exposure to Radionuclides in Air, Water, and Soil," EPA 402-R-93-081, September 1993.
ENGINEERED SAFETY FEATURE (ESF) RESPONSE TIME	The ESF RESPONSE TIME shall be the time interval from when the monitored parameter exceeds its ESF actuation setpoint at the channel sensor until the ESF equipment is capable of performing its safety function ~~(e.g., valves travel to their required positions, pump discharge pressures reach their required values)~~. Times shall include emergency diesel generator starting and sequence loading delays, where applicable. The response time may be measured by means of any series of sequential, overlapping, or total steps so that the entire response time is measured.
LCO SELECTION CRITERIA	LCO (Limiting Conditions for Operation) is the lowest functional capability and performance level required for the safe operation of the nuclear facility. The selection criteria for LCO are classified as the following four categories per 10 CFR 50:

(i.e., the valves travel to their required positions, pump discharge pressures reach their required values, etc.)

In lieu of measurement, response time may be verified for selected components provided that the components and methodology for verification have been previously reviewed and approved by the NRC.

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**439-8524**
SRP Section:	**16.3.3.13 – Logarithmic Power Monitoring Channels**
Application Section:	**16.3.3.13**
Date of RAI Issue:	**03/11/2016**

Question No. 16-128

1. The applicant is requested to revise the generic TS 3.3.13 LCO statement as indicated:

   LCO 3.3.13 Two logarithmic power level monitoring instrumentation **channels** shall be OPERABLE.

2. The applicant is requested to edit and format the generic TS 3.3.13 Applicability statement as indicated (see Writer's Guide Sections 2.5.4.b.1 and 4.1.5) by the following markup:

   APPLICABILITY: MODES 3, 4, and 5 with the reactor trip switchgears (RTSGs) open or ~~control element assembly~~ **Control Element Assembly** (CEA) ~~drive system~~ **Drive System** not capable of CEA withdrawal.

3. The Bases for SR 3.3.13.2 of generic TS 3.3.13, contains a sentence, "At this unit, the channel trip Functions tested by the CHANNEL FUNCTIONAL TEST are as follows:" This sentence implies there is additional material, but the material is missing. This sentence corresponds to a bracketed sentence in the Bases for STS SR 3.3.13.2. However, the sentence is not needed because the specified Channel Functional Test only applies to the required logarithmic power level monitoring channels. The applicant is requested to remove this sentence.

4. The applicant is requested to make the following editorial and grammatical corrections to the Bases of generic TS 3.3.13, as indicated, for:

   • SR 3.3.13.2
   – revise first paragraph, last sentence

   The 31 day ~~This~~ Frequency is the same as that employed for the same channels in the other applicable MODES.

– revise third paragraph by changing “as-left and as–found setting” to “as-left and as-found settings”

• SR 3.3.13.3
– revise last sentence of first paragraph by changing “as-left and as–found setting” to “as-left and as-found settings”

5. The applicant is requested to make the following editorial and grammatical corrections to the “Actions” section of the Bases of generic TS 3.3.13, by placing the material beginning with the second sentence under the heading “A.1 and A.2” right after the first sentence, instead of staring a new paragraph, to match the STS presentation.

6. The “Actions” section of the Bases for STS 3.3.13B addresses the Note for Required Action A.1 (“Suspend all operations involving positive reactivity additions. | Immediately”) with the last sentence of the first paragraph under the heading “A.1 and A.2”:

> Required Action A.1 is modified by a Note to indicate that normal plant control operations that individually add limited positive reactivity (e.g., temperature or boron fluctuations associated with RCS inventory management or temperature control) are not precluded by this Action, provided they are accounted for in the calculated SDM.

In the same location in the “Actions” section of the Bases for generic TS 3.3.13, the last sentence of the first paragraph under the heading “A.1 and A.2” instead says:

> Required Action A.1 therefore requires that all positive reactivity additions that are under operator control, such as boron dilution or reactor coolant system temperature changes, be halted immediately to preserve SDM.

Since the generic TS Note for Required Action A.1 is the same as the STS Note for Required Action A.1 (“Limited plant cooldown or boron dilution is allowed provided the change is accounted for in the calculated SDM.”), the applicant is requested to make the generic TS Bases sentence consistent with the STS Bases sentence.

Response

1. The word “channels” will be inserted into the LCO statement; however, to be consistent with STS 3.3.13 the LCO will be revised to state “Two channels of logarithmic power level monitoring instrumentation shall be OPERABLE” rather than “Two logarithmic power level monitoring instrumentation channels shall be OPERABLE.”

2. According to the Writer’s Guide Sections 2.5.4.b.1 and 4.1.5, the applicability statement will be indented the second and third rows and “control element assembly (CEA) drive system” will be revised to “Control Element Assembly (CEA) Drive System” as requested. Thus, the applicability statement for 3.3.13 will be revised as below:

> APPLICABILITY: MODES 3, 4, and 5 with the reactor trip switchgears (RTSGs) open or Control Element Assembly (CEA) Drive System not capable of CEA withdrawal.

3. For the Bases of SR 3.3.13.2, “At this unit, the channel trip Functions tested by the CHANNEL FUNCTIONAL TEST are as follows:” will be deleted as requested.

4. For the Bases of SR 3.3.13.2, “This Frequency” and “as-left and as-found setting” will be revised to “The 31 day Frequency” and “as-left and as-found settings” as requested.

   The Bases of SR 3.3.13.3 will also be changed from “as-left and as-found setting” to “as-left and as-found settings.”

5. The separate paragraphs under the heading “A.1 and A.2” in the Actions section of TS B3.3.13 will be revised into one paragraph as requested.

6. The generic TS Bases sentence in the Actions section for 3.3.13 that addresses the Note for Required Action A.1 will be revised to be consistent with the STS Bases sentence.

Impact on DCD

Same as changes described in the Impact on Technical Specifications section.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

TS 3.3.13 and the associated Bases will be revised as mentioned above.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical or Environmental Report.

Two channels of logarithmic power level monitoring instrumentation

3.3 INSTRUMENTATION

3.3.13 Logarithmic Power Monitoring Channels

LCO 3.3.13 ~~Two logarithmic power level monitoring instrumentation~~ shall be OPERABLE.

~~APPLICABILITY: MODES 3, 4, and 5 with the reactor trip switchgears (RTSGs) open or control element assembly (CEA) drive system not capable of CEA withdrawal.~~

APPLICABILITY: MODES 3, 4, and 5 with the reactor trip switchgears (RTSGs) open or Control Element Assembly (CEA) Drive System not capable of CEA withdrawal.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more required channel(s) inoperable.	A.1 ----------NOTE---------- Limited plant cooldown or boron dilution is allowed. ---------- Suspend all operations involving positive reactivity additions.	Immediately
	AND	
	A.2 Perform SDM verification in accordance with SR 3.1.1.1 if T_{cold} > 99 °C (210 °F) or SR 3.1.2.1 if T_{cold} ≤ 99 °C (210 °F).	4 hours AND Once per 12 hours thereafter

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.3.13.1	Perform CHANNEL CHECK.	12 hours
SR 3.3.13.2	Perform CHANNEL FUNCTIONAL TEST in accordance with Setpoint Control Program.	31 days
SR 3.3.13.3	----------NOTE---------- Neutron detectors are excluded from CHANNEL CALIBRATION. ---------- Perform CHANNEL CALIBRATION in accordance with Setpoint Control Program.	18 months

BASES

APPLICABLE SAFETY ANALYSES (continued)

The OPERABILITY of logarithmic power monitoring channels is necessary to meet the assumption of the safety analyses and to provide for the mitigation of accident and transient conditions.

The logarithmic power monitoring channels satisfy LCO SELECTION CRITERION 3.

LCO

The LCO on the logarithmic power monitoring channels ensures that adequate information is available to verify core reactivity conditions while shut down.

A minimum of two logarithmic power monitoring channels are required to be OPERABLE.

APPLICABILITY

In MODES 3, 4, and 5, with RTSGs open or the control element assembly (CEA) drive system not capable of CEA withdrawal, logarithmic power monitoring channels must be OPERABLE to monitor core power for reactivity changes. In MODES 1 and 2, and in MODES 3, 4, and 5, with the RTSGs shut and the CEAs capable of withdrawal, the logarithmic power monitoring channels are addressed as part of the RPS in LCO 3.3.1, “Reactor Protection System Instrumentation – Operating,” and LCO 3.3.2, “Reactor Protection System Instrumentation – Shutdown.”

The requirements for startup range neutron flux monitoring in MODE 6 are addressed in LCO 3.9.2, "Nuclear Instrumentaion" The startup range nuclear monitoring channels provide neutron flux coverage extending an additional one to two decades below the logarithmic channels for use during refueling, when neutron flux could be extremely low.

ACTIONS

A channel is inoperable when it does not satisfy the OPERABILITY criteria for the channel's function. These criteria are outlined in the LCO section of the Bases.

A.1 and A.2

With one required channel inoperable, it may not be possible to perform a CHANNEL CHECK to verify that the other required channel is OPERABLE.

This paragraph will be merged with the following paragraph.

BASES

ACTIONS (continued)

Therefore, with one or more required channels inoperable, the logarithmic power monitoring Function cannot be reliably performed. Consequently, the Required Actions are the same for one required channel inoperable or more than one required channel inoperable. The absence of reliable neutron flux indication makes it difficult to ensure SDM is maintained. ~~Required Action A.1 therefore requires that all positive reactivity additions that are under operator control, such as boron dilution or reactor coolant system temperature changes, be halted immediately to preserve SDM.~~

SDM must be verified periodically to ensure that it is being

Required Action A.1 is modified by a Note to indicate that normal plant control operations that individually add limited positive reactivity (e.g., temperature or boron fluctuations associated with RCS inventory management or temperature control) are not precluded by this Action, provided they are accounted for in the calculated SDM.

~~are based on operating experience in performing the Required~~ Actions and the fact that plant conditions will change slowly.

SURVEILLANCE REQUIREMENTS

SR 3.3.13.1

SR 3.3.13.1 is the performance of a CHANNEL CHECK on each required channel every 12 hours. A CHANNEL CHECK is a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based upon the assumption that instrument channels monitoring the same parameter should read approximately the same value. Significant deviations between instrument channels could be an indication of excessive instrument drift in one of the channels or of something even more serious. CHANNEL CHECK will detect gross channel failure, thus it is the key to verifying that the instrumentation continues to operate properly between each CHANNEL CALIBRATION.

Agreement criteria are determined by the plant staff and should be based on a combination of the channel instrument uncertainties including indication, and readability. If a channel is outside of the criteria, it could be an indication that the preamplifier or the signal processing equipment has drifted outside of its limits. If the channels are within the criteria, it is an indication that the channels are OPERABLE.

SURVEILLANCE REQUIREMENTS (continued)

The Frequency, about once every shift, is based on operating experience that demonstrates the rarity of channel failure. Since the probability of two random failures in redundant channels in any 12-hour period is extremely low, CHANNEL CHECK minimizes the chance of loss of protection function due to failure of redundant channels. CHANNEL CHECK supplements check of channel OPERABILITY during normal operational use of displays associated with the LCO required channels.

SR 3.3.13.2

A CHANNEL FUNCTIONAL TEST is performed every 31 days to ensure that the entire channel is capable of properly indicating neutron flux. Internal test circuitry is used to feed pre-adjusted test signals into the preamplifier to verify channel alignment. It is not necessary to test the detector, because generating a meaningful test signal is difficult; the detectors are of simple construction, and any failures in the detectors will be apparent as change in channel output. This Frequency is the same as that employed for the same channels in the other applicable MODES.

The 31 day

~~At this unit, the channel trip Functions tested by the CHANNEL FUNCTIONAL TEST are as follows:~~

The Setpoint Control Program (SCP) has controls which require verification that the instrument channel functions as required by verifying the ~~as-left and as-found setting~~ are consistent with those established by the setpoint methodology.

SR 3.3.13.3

SR 3.3.13.3 is the performance of a CHANNEL CALIBRATION. A CHANNEL CALIBRATION is performed every 18 months. The Surveillance is a complete check and readjustment of the logarithmic power channel from the preamplifier input through to a remote display. The Surveillance verifies that the channel responds to a measured parameter within the necessary range and accuracy. CHANNEL CALIBRATION leaves the channel adjusted to account for instrument drifts between successive calibrations to ensure that the channel remains operational between successive surveillance. The SCP has controls which require verification that the instrument channel functions as required by verifying the ~~as-left and as-found setting~~ are consistent with those established by the setpoint methodology.

as-left and as-found settings