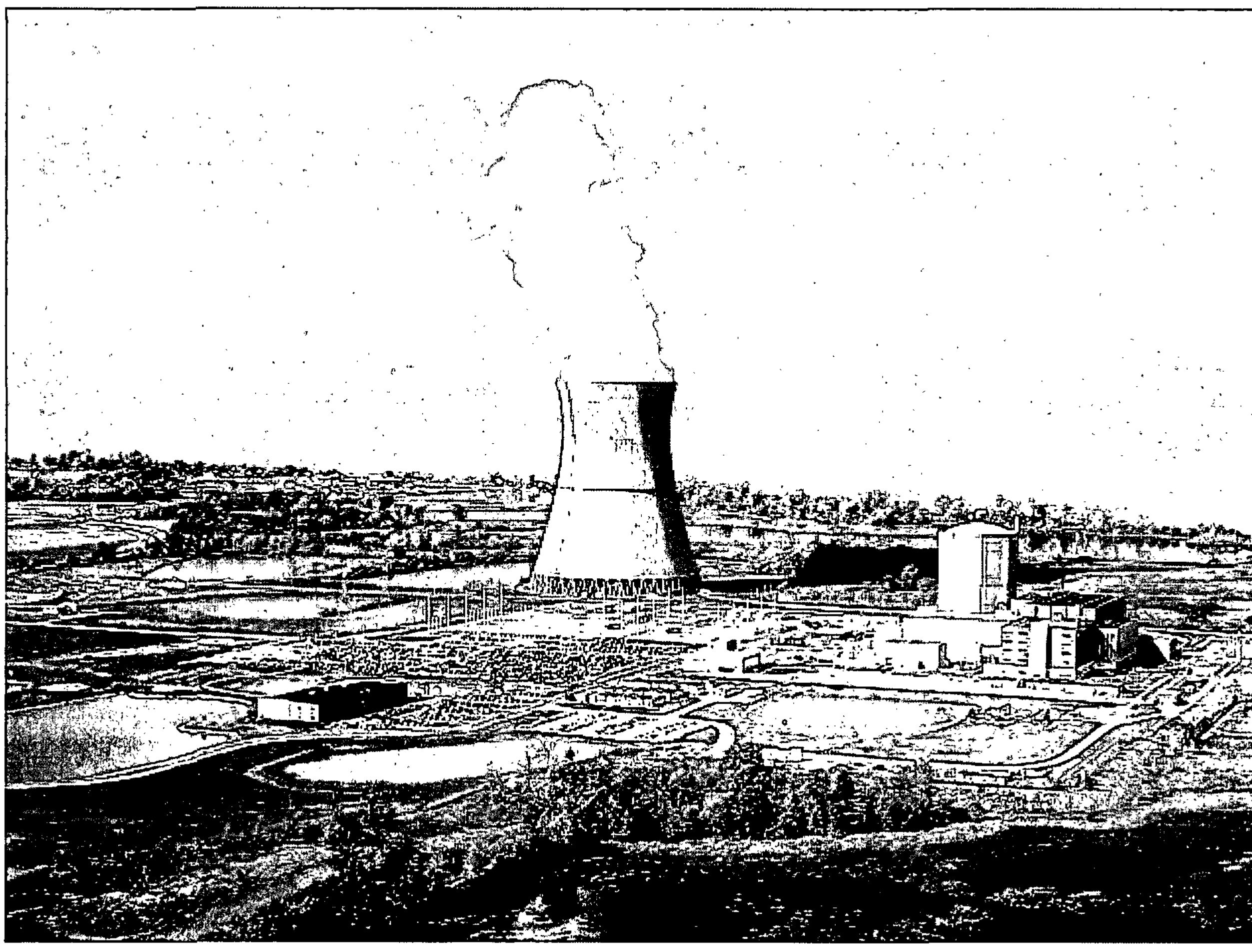
DAVIS-BESSE NUCLEAR POWER STATION
UNIT 1

IMPROVED TECHNICAL SPECIFICATION CONVERSION LICENSE AMENDMENT REQUEST



VOLUME 7 (Rev. 1)

SECTION 3.2 - POWER DISTRIBUTION LIMITS

Summary of Changes
ITS Section 3.2

Change Description	Affected Pages
The changes described in the Davis-Besse response to question 200802211310 have been made, with the exception that typographical errors in the first sentence of the draft markup of JFD 6 provided in the response has been corrected ("ITS 3.2.4 (ISTS)" has been changed to "ISTS 3.2.4" and "to less than or equal to" has been changed to "of greater than or equal to"). This change deletes the phrase "from the ALLOWABLE THERMAL POWER" from ITS 3.2.4 Required Action A.1.2.2, consistent with similar wording in the Required Actions of ITS 3.2.5.	Pages 87 and 90
Added titles for UFSAR Appendix 3D references in the Bases (editorial change for consistency with the resolution to a question on a different section).	Pages 31, 49, 71, and 102

ATTACHMENT 1

VOLUME 7

DAVIS-BESSE IMPROVED TECHNICAL SPECIFICATIONS CONVERSION

ITS SECTION 3.2 POWER DISTRIBUTION LIMITS

Revision 1

LIST OF ATTACHMENTS

ATTACHMENT 1

ITS 3.2.1, REGULATING ROD INSERTION LIMITS

Current Technical Specification (CTS) Markup and Discussion of Changes (DOCs)

ITS 3.2.1

ITS

A01

REACTIVITY CONTROL SYSTEMS

REGULATING ROD INSERTION LIMITS

LIMITING CONDITION FOR OPERATION

LCO 3.2.1

3.1.3.6 The regulating rod groups shall be positioned within the acceptable operating limits for regulating rod position provided in the CORE OPERATING LIMITS REPORT. A02

APPLICABILITY: MODES 1* and 2*#. M01

ACTION:

ACTION A, ACTION D, ACTION C, LCO Note

With the regulating rod groups inserted beyond the operating limits (in a region other than acceptable operation), or with any group sequence or overlap outside the limits provided in the CORE OPERATING LIMITS REPORT except for surveillance testing pursuant to Specification 4.1.3.1.2, either: Add proposed Required Actions A.1 and C.1

Required Actions A.2, C.2, and D.2.1

a. Restore the regulating groups to within the limits provided in the CORE OPERATING LIMITS REPORT within 2 hours, or L01

ACTION B, Required Action D.2.2

b. Reduce THERMAL POWER to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the rod group position limits provided in the CORE OPERATING LIMITS REPORT within 2 hours, or

ACTION E

c. Be in at least HOT STANDBY within 6 hours.

ACTION D

NOTE: If in unacceptable region, also see Section 3/4.1.1.1.

~~*See Special Test Exception 3.10.1 and 3.10.2.~~ A02

~~#With $K_{eff} \geq 1.0$.~~ M01

ITS 3.2.1

ITS

A01

REACTIVITY CONTROL SYSTEMS

REGULATING ROD INSERTION LIMITS

SURVEILLANCE REQUIREMENTS

SR 3.2.1.1, SR 3.2.1.2

4.1.3.6 The position of each regulating group shall be determined to be within the limits provided in the CORE OPERATING LIMITS REPORT at least once every 12 hours ~~except when:~~

~~a. The regulating rod insertion limit alarm is inoperable, then verify the groups to be within the insertion limits at least once per 4 hours;~~

~~b. The control rod drive sequence alarm is inoperable, then verify the groups to be within the sequence and overlap limits at least once per 4 hours.~~

L02

ITS 3.2.1

A01

ITS

3/4.1 REACTIVITY CONTROL SYSTEMS

3/4.1.1 BORATION CONTROL

SHUTDOWN MARGIN

LIMITING CONDITION FOR OPERATION

See ITS 3.1.1, ITS 3.1.8, and ITS 3.1.9

A02

See ITS 3.1.1, ITS 3.1.2, and ITS 3.1.9

3.1.1.1 The SHUTDOWN MARGIN shall be ≥ 1% Δk/k.

APPLICABILITY: MODES 1, 2#, 3**, 4 and 5.

within 15 minutes

L03

See ITS 3.1.1

ACTION:

Regulating rods groups inserted in unacceptable operation region

A01

L04

Required Action D.1

With the SHUTDOWN MARGIN < 1% Δk/k, immediately initiate ~~and continue~~ boration at ≥ 25 gpm of 7875 ppm boron or its equivalent, until the required SHUTDOWN MARGIN is restored.

within limits specified in the COLR

LA01

SURVEILLANCE REQUIREMENTS

SR 3.2.1.3 4.1.1.1.1 The SHUTDOWN MARGIN shall be determined to be ~~≥ 1% Δk/k~~:

See ITS 3.1.4

a. Within one hour after detection of an inoperable control rod(s) and at least once per 12 hours thereafter while the rod(s) is inoperable. If the inoperable control rod is immovable or untrippable, the above required SHUTDOWN MARGIN shall be increased by an amount at least equal to the withdrawn worth of the immovable or untrippable control rod(s).

See ITS 1.0

M01

SR 3.2.1.1, SR 3.2.1.2

b. When in MODES 1 or 2#, at least once per 12 hours, by verifying that regulating rod groups withdrawal is within the limits of Specification 3.1.3.6.

L05

SR 3.2.1.3

c. When in MODE 2## within 4 hours prior to achieving reactor criticality by verifying that the predicted critical control rod position is within the limits of Specification 3.1.3.6.

LA02

d. Prior to initial operation above 5% RATED THERMAL POWER after each fuel loading by consideration of the factors of e. below, with the regulating rod groups at the maximum insertion limit of Specification 3.1.3.6.

See ITS 3.1.1

A02

See ITS 3.1.1

*See Special Test Exception 3.10.4

**See LCO 3.7.9, Steam Generator Level, for additional SHUTDOWN MARGIN requirements.

#With $k_{eff} \geq 1.0$

M01

##With $k_{eff} < 1.0$

L05

DISCUSSION OF CHANGES
ITS 3.2.1, REGULATING ROD INSERTION LIMITS

ADMINISTRATIVE CHANGES

A01 In the conversion of the Davis-Besse Current Technical Specifications (CTS) to the plant specific Improved Technical Specifications (ITS), certain changes (wording preferences, editorial changes, reformatting, revised numbering, etc.) are made to obtain consistency with NUREG-1430, Rev. 3.1, "Standard Technical Specifications-Babcock and Wilcox Plants" (ISTS).

These changes are designated as administrative changes and are acceptable because they do not result in technical changes to the CTS.

A02 The Applicability of CTS 3.1.3.6 is MODES 1 and 2 with footnote * stating "See Special Test Exception 3.10.1 and 3.10.2." The Applicability of CTS 3.1.1.1 includes MODE 1 and MODE 2, however MODE 2 footnote * states "See Special Test Exception 3.10.4." ITS 3.2.1 Applicability does not contain the footnote or a reference to any Special Test Exception.

The purpose of the footnote references is to alert the user that a Special Test Exception exists that may modify the Applicability of the Specification. It is an ITS convention to not include these types of footnotes or cross-references. This change is designated as administrative as it incorporates an ITS convention with no technical change to the CTS.

MORE RESTRICTIVE CHANGES

M01 CTS 3.1.3.6 requires the regulating rod groups to be positioned within acceptable limits during operations in MODES 1 and MODE 2 with keff ≥ 1.0. CTS 3.1.1.1 requires SHUTDOWN MARGIN to be met in MODES 1 and MODE 2 however CTS 4.1.1.1.1.b only requires a verification that SHUTDOWN MARGIN is within limits by verifying that regulating rod groups withdrawal is within limits in MODE 1 and MODE 2 with keff ≥ 1.0. ITS 3.2.1 requires the regulating rod insertion limits to apply at all times in MODES 1 and 2 and ITS SR 3.2.1.1 and SR 3.2.1.2 require verification in these modes. This changes the CTS by expanding the applicability of the regulating rod groups and requires verification to include MODE 2 with $k_{eff} < 1.0$.

The purpose of the CTS 3.1.3.6 is to ensure the regulating rod groups are at the acceptable operating limits to help ensure SHUTDOWN MARGIN is met. CTS 3.1.3.6 and CTS 3.1.1.1.1 help to ensure SHUTDOWN MARGIN is met in MODES 1 and 2; however, there is no specific requirement to verify SHUTDOWN MARGIN at a consistent frequency when in MODE 2 with keff < 1.0 except the requirement in CTS 4.1.1.1.1.c (ITS SR 3.2.1.3). This change is acceptable because the ITS requires the regulating rod insertion limits to apply at all times in MODES 1 and 2 to help ensure SHUTDOWN MARGIN is maintained. This change is designated as more restrictive because it expands the conditions for regulating rod groups and expands the conditions under which a Surveillance must be performed.

DISCUSSION OF CHANGES
ITS 3.2.1, REGULATING ROD INSERTION LIMITS

RELOCATED SPECIFICATIONS

None

REMOVED DETAIL CHANGES

LA01 *(Type 5 – Removal of Cycle-Specific Parameter Limits from the Technical Specifications to the Core Operating Limits Report)* CTS 4.1.1.1 requires that the SDM be $\geq$ 1% $\Delta k/k$. ITS 3.2.1.3 states that the SDM shall be within the limits of the COLR. This changes the CTS by relocating the SDM limit, which must be confirmed on a cycle-specific basis, to the COLR.

The removal of these cycle-specific parameter limits from the Technical Specifications to the COLR is acceptable because the cycle-specific limits are developed or utilized under NRC-approved methodologies which will ensure that the Safety Limits are met. The NRC documented in Generic Letter 88-16, "Removal of Cycle-Specific Parameter Limits From Technical Specifications," that this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The ITS still retains the SDM requirement. The methodologies used to develop the parameters in the COLR have obtained prior approval by the NRC in accordance with Generic Letter 88-16. Also, this change is acceptable because the removed information will be adequately controlled in the COLR under the requirements provided in ITS 5.6.3, "CORE OPERATING LIMITS REPORT." ITS 5.6.3 ensures that the applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems limits, and nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analyses are met. This change is designated as a less restrictive removal of detail change because information relating to cycle-specific parameter limits is being removed from the Technical Specifications.

LA02 *(Type 3 – Removing Procedural Details for Meeting TS Requirements or Reporting Requirements)* CTS 4.1.1.1.1.c requires verification that SHUTDOWN MARGIN is within limit by verifying the "predicted critical control rod position is within the limits" of Specification 3.1.3.6. ITS SR 3.2.1.3 requires verification that SDM is within the limits. This changes the CTS by removing details of how to perform the SHUTDOWN MARGIN verification to the Bases.

The removal of these details for performing a Surveillance Requirement from the Technical Specifications is acceptable because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The ITS still retains the requirement to verify SDM is within the limit. Also, this change is acceptable because these types of procedural details will be adequately controlled in the ITS Bases. Changes to the Bases are controlled by the Technical Specification Bases Control Program in Chapter 5. This program provides for the evaluation of changes to ensure the Bases are properly controlled. This change is designated as a less restrictive removal of detail change because procedural details for meeting Technical Specification requirements are being removed from the Technical Specifications.

DISCUSSION OF CHANGES
ITS 3.2.1, REGULATING ROD INSERTION LIMITS

LESS RESTRICTIVE CHANGES

L01 *(Category 3 – Relaxation of Completion Time)* The CTS 3.1.3.6 Action requires entry with the regulating rod groups inserted beyond the operating limits (in a region other than acceptable operation) or with any group sequence or overlap outside the limits. CTS 3.1.3.6 provides three optional Required Actions. CTS 3.1.3.6 Action a requires restoration of the regulating groups to within the limits within 2 hours. CTS 3.1.3.6 Action b requires the reduction in THERMAL POWER to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the rod group position limits. CTS 3.1.3.6 Action c requires the plant to be in Hot Standby (MODE 3) within 6 hours. ITS 3.2.1 ACTION A requires entry when regulating rod groups are inserted in the restricted operational region. ITS 3.2.1 ACTION C requires entry when regulating rod groups sequence or overlap limits are not met. ITS 3.2.1 ACTION D requires entry when regulating rod groups are inserted in the unacceptable operational region. ITS 3.2.1 ACTION A requires the performance of ITS SR 3.2.5.1 once per 2 hours when THERMAL POWER is > 20% RTP and the restoration of regulating rod groups to within limits within 24 hours from discovery of failure to meet the LCO. ITS 3.2.1 ACTION B covers the conditions when the Required Actions and associated Completion Times of Condition A are not met when the plant is operating in the restricted operational region and it allows 2 hours to reduce THERMAL POWER to less than or equal to THERMAL POWER allowed by regulating rod group insertion limits. ITS 3.2.1 ACTION C requires performance of ITS SR 3.2.5.1 within 2 hours when THERMAL POWER is > 20% RTP and the restoration of regulating rod groups to within limits within 4 hours. ITS 3.2.1 ACTION D, in part, requires the restoration of the rod groups to within restricted operating region within 2 hours or a reduction of THERMAL POWER to less than or equal to the THERMAL POWER allowed by the regulating rod group insertion limits. This changes the CTS by extending the Completion Time to restore regulating rod groups to within limits from 2 hours to 24 hours when regulating rod groups are inserted in restricted operational region, and from 2 hours to 4 hours when regulating rod groups are not within the sequence or overlap limits. However it provides an additional requirement to verify F_Q and $F^N_{\Delta H}$ are within their limits once per 2 hours (for ITS 3.2.1 ACTION A) or within 2 hours (for ITS 3.2.1 ACTION C) during the extended Completion Times. This change also provides an additional allowance to operate in the restricted operational region for an additional 2 hours (after the 24 hours period) to reduce THERMAL POWER to less than or equal to THERMAL POWER allowed by regulating rod group insertion limits.

The purpose of the CTS 3.1.3.6 Actions are to preclude long term depletion with abnormal group insertions or configurations, thereby limiting the potential for an adverse xenon redistribution. This change is acceptable because the Completion Time is consistent with safe operation under the specified Condition, considering the OPERABLE status of the redundant systems or features. This includes the capacity and capability of remaining systems or features, a reasonable time for repairs or replacement, and the low probability of a DBA occurring during the allowed Completion Time. The CTS is changed in several ways. The Completion Time to restore regulating rod groups to within limits has been extended from 2 hours to 24 hours when regulating rod groups are inserted

DISCUSSION OF CHANGES
ITS 3.2.1, REGULATING ROD INSERTION LIMITS

in restricted operational region and from 2 hours to 4 hours when regulating rod groups are not within the sequence or overlap limits. However during the time an additional requirement to verify F_Q and $F^N_{\Delta H}$ are within their limits once per 2 hours (for ITS 3.2.1 ACTION A) and within 2 hours (for ITS 3.2.1 ACTION C) is required. This change also provides an additional allowance to operate in the restricted operational region for an additional 2 hours (after the 24 hours period) to reduce THERMAL POWER to less than or equal to THERMAL POWER allowed by regulating rod group insertion limits. Operation with the regulating rods in the restricted region or with any group sequence or overlap outside the limits potentially violates the LOCA LHR limits (F_Q limits), or the loss of flow accident DNB peaking limits ($F^N_{\Delta H}$ limits). Verification that F_Q and $F^N_{\Delta H}$ are within their limits ensures that operation with the regulating rods inserted into the restricted region does not violate the ECCS or DNB criteria. The required Completion Time of 2 hours is acceptable in that it allows the operator sufficient time for obtaining a power distribution map and for verifying the power peaking factors. Repeating SR 3.2.5.1 every 2 hours for ITS 3.2.1 ACTION A is acceptable because it ensures that continued verification of the power peaking factors is performed as core conditions (primarily regulating rod insertion and induced xenon redistribution) change. SR 3.2.5.1 is only required when THERMAL POWER is greater than 20% RTP. This establishes a Required Action that is consistent with the Applicability of LCO 3.2.5, "Power Peaking Factors." Indefinite operation with the regulating rods inserted in the restricted region, or in violation of the group sequence or overlap limits, is not prudent. Even if power peaking monitoring is continued, reactivity limits may not be met and the abnormal regulating rod insertion or group configuration may cause an adverse xenon redistribution, may cause the limits on AXIAL POWER IMBALANCE to be exceeded, or may adversely affect the long term fuel depletion pattern. Therefore, power peaking monitoring is allowed for up to 24 hours after discovery of failure to meet the LCO for ITS 3.2.1 ACTION A and only up to 4 hours for ITS 3.2.1 ACTION C. This required Completion Time 24 hours after discovery of failure to meet the LCO (for ITS 3.2.1 ACTION A) and 4 hours (for ITS 3.2.1 ACTION C) is reasonable based on the low probability of an event occurring simultaneously with the limit out of specification in this relatively short time period. If the regulating rods cannot be restored within the insertion limits, then the insertion limits can be restored by reducing the THERMAL POWER to a value allowed by the regulating rod insertion limits. The required Completion Time of 2 hours is sufficient to allow the operator to complete the power reduction in an orderly manner and without challenging the plant systems. Operation for up to 2 hours more in the restricted region is acceptable, based on the low probability of an event occurring simultaneously with the limit out of specification in this relatively short time period. In addition, it precludes long term depletion with abnormal group insertions or configurations and limits the potential for an adverse xenon redistribution. If the regulating rods cannot be restored to within the insertion limits as required by ITS 3.2.1 ACTIONS A and C, or if the power reduction cannot be completed within the required Completion Time as required by ITS 3.2.1 ACTION B, then the reactor is placed in MODE 3, in which this LCO does not apply. This change is designated as less restrictive because additional time is allowed to restore parameters to within the LCO limits than was allowed in the CTS.

DISCUSSION OF CHANGES
ITS 3.2.1, REGULATING ROD INSERTION LIMITS

L02 *(Category 7 – Relaxation of Surveillance Frequency - Non-24 Month Type Change)* CTS 4.1.3.6 requires the position of each regulating group to be determined to be within the limits provided in the COLR at least once every 12 hours except during time intervals when the regulating rod insertion limit alarm or the control rod drive sequence alarm is inoperable. With either of these alarms inoperable, CTS 4.1.3.6.a requires a verification that the rod groups are within the insertion limits at least once per 4 hours and CTS 4.1.3.6.b requires a verification that the rod groups are within the sequence or overlap limits at least once per 4 hours, respectively. ITS SR 3.2.1.1 requires verification that regulating rod groups are within the sequence and overlap limits of the COLR every 12 hours, and ITS SR 3.2.1.2 requires verification that the regulating rod groups meet the insertion limits specified in the COLR every 12 hours. This changes the CTS by eliminating the requirement to verify that each regulating group is within insertion limits at accelerated frequencies when the regulating rod insertion limit alarm or the control rod drive sequence alarm is inoperable.

The purpose of CTS 4.1.3.6 is to periodically verify that the regulating rods are within the limits specified in the LCO. This change is acceptable because increasing the Frequency of regulating rod insertion limit verification when the regulating rod insertion limit alarm or the control rod drive sequence alarm is inoperable is unnecessary. An inoperability of the alarm does not increase the probability that the regulating rod insertion limits are not met. The routine 12 hour Frequencies (ITS SR 3.2.1.1 and SR 3.2.1.2) continue to ensure the regulating rod limits are met. Furthermore, the regulating rod insertion limit alarm and the control rod drive sequence alarm are for indication only. Their use is not credited in any safety analyses. Thus, any response determined necessary by plant personnel due to an inoperable alarm is more appropriately controlled by plant procedures, not Technical Specifications. This change is designated as less restrictive because Surveillances will be performed less frequently under the ITS than under the CTS.

L03 *(Category 3 – Relaxation of Completion Time)* CTS 3.1.3.6 Action Note requires entry into the Actions of CTS 3.1.1.1 if the plant is in the unacceptable region specified in the COLR. The CTS 3.1.1.1 Action states that when the SHUTDOWN MARGIN is less than the applicable limit, boration must be initiated immediately. Under the same conditions in the ITS, ITS 3.2.1 Required Action D.1 states that boration must be initiated within 15 minutes. This changes the CTS by relaxing the Completion Time from "immediately" to 15 minutes.

The purpose of CTS 3.1.1.1 Action is to restore the SDM to within its limit promptly. This change is acceptable because the Completion Time is consistent with safe operation under the specified Condition, considering a reasonable time for restoration and the low probability of a DBA occurring during the allowed Completion Time. The ITS Completion Time of 15 minutes is adequate for an operator to correctly align and start the required systems and components. In addition, the ITS Bases for the ACTION state that boration must be initiated promptly. This change is designated as less restrictive because additional time is allowed to restore parameters to within the LCO limits than was allowed in the CTS.

DISCUSSION OF CHANGES
ITS 3.2.1, REGULATING ROD INSERTION LIMITS

L04 *(Category 4 – Relaxation of Required Action)* CTS 3.1.1.1 Action states that when the SDM is not within the applicable limits, boration must be initiated and continued at ≥ 25 gpm of a solution containing ≥ 7875 ppm boron or its equivalent until the required SDM is restored. ITS 3.2.1 Required Action D.1 states that with the regulating rod groups inserted in the unacceptable operational region to initiate boration to restore SDM to within limits. This changes the CTS by eliminating the specific values of flow rate and boron concentration that must be used to restore compliance with the LCO.

The purpose of the CTS 3.1.1.1 Action is to restore the SDM to within its limits. This change is acceptable because the Required Actions are used to establish remedial measures that must be taken in response to the degraded conditions in order to minimize risk associated with continued operation while providing time to repair inoperable features. The Required Actions are consistent with safe operation under the specified Condition, considering the operability status of the redundant systems of required features, the capacity and capability of remaining features, a reasonable time for repairs or replacement of required features, and the low probability of a DBA occurring during the repair period. Removing the specific values of flow rate and boron concentration from the CTS Action provides flexibility in the restoration of the SDM and eliminates conflicts between the SDM value and the specific boration values in the CTS Action. As stated in the ITS 3.1.1 Bases for ACTION A, "In the determination of the required combination of boration flow rate and boron concentration, there is no unique requirement that must be satisfied. Since it is imperative to raise the boron concentration of the RCS as soon as possible, the boron concentration should be a highly concentrated solution, such as that normally found in the boric acid storage tank or the borated water storage tank. The operator should borate with the best source available for the plant conditions." Specifying a minimum flow rate and concentration in the ACTION may not accomplish the objective of raising the RCS boron concentration as soon as possible. This change is designated as less restrictive because less stringent Required Actions are being applied in the ITS than were applied in the CTS.

L05 *(Category 7 – Relaxation Of Surveillance Frequency - Non-24 Month Type Change)* CTS 4.1.1.1.1.c requires verification of SDM, when in MODE 2 with k_{eff} < 1.0, within 4 hours prior to achieving reactor criticality. ITS SR 3.2.1.3 requires SDM to be verified within limit within 4 hours prior to achieving criticality. This changes the CTS by eliminating the explicit statement that the Surveillance is required to be performed in MODE 2.

The purpose of CTS 4.1.1.1.1.c is to estimate the critical position of the control rods 4 hours prior to going critical. This change is acceptable because the proposed Surveillance Frequency of within 4 hours prior to achieving criticality ensures that there is sufficient SDM capability with the control rods at the estimated critical position. CTS 4.1.1.1.1.c requires verification of SDM, when in MODE 2 with k_{eff} < 1.0, within 4 hours prior to achieving reactor criticality. ITS SR 3.2.1.3 requires SDM to be within limit within 4 hours prior to achieving criticality. This change eliminates the explicit statement that the Surveillance is required to be performed in MODE 2. The Surveillance may be performed in another MODE as long as it is performed within 4 hours of going critical. The Surveillance Frequency still requires the estimated critical position to be

DISCUSSION OF CHANGES
ITS 3.2.1, REGULATING ROD INSERTION LIMITS

determined within 4 hours prior to criticality and is therefore acceptable because it provides sufficient time to establish the estimated critical position after the determination is performed. This change is designated as less restrictive because the Surveillance is not required to be performed in MODE 2.

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Improved Standard Technical Specifications (ISTS) Markup and Justification for Deviations (JFDs)

CTS

3.2 POWER DISTRIBUTION LIMITS

3.2.1 Regulating Rod Insertion Limits

3.1.3.6 LCO 3.2.1 Regulating rod groups shall be within the physical insertion, sequence, and overlap limits specified in the COLR.

3.1.3.6 Action

--NOTE--
Not required for any regulating rod repositioned to perform SR 3.1.4.2.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CTS	CONDITION	REQUIRED ACTION	COMPLETION TIME
3.1.3.6 Action a	A. Regulating rod groups inserted in restricted operational region, or sequence or overlap, or any combination, not met.	A.1 --------------NOTE-------------- Only required when THERMAL POWER is > 20% RTP. ------------------------------------ Perform SR 3.2.5.1.	Once per 2 hours
		AND	
		A.2 Restore regulating rod groups to within limits.	24 hours from discovery of failure to meet the LCO 1
3.1.3.6 Action b	B. Required Action and associated Completion Time of Condition A not met.	B.1 Reduce THERMAL POWER to less than or equal to THERMAL POWER allowed by regulating rod group insertion limits.	2 hours

INSERT 1

1

3.2.1

CTS

1 **INSERT 1**

CTS	Condition	Required Action	Completion Time
3.1.3.6 Action a	C. Regulating rod groups sequence or overlap limits not met.	C.1 ----------------NOTE---------------- Only required when THERMAL POWER is > 20% RTP. -- Perform SR 3.2.5.1.	2 hours
		AND	
		C.2 Restore regulating rod groups to within limits.	4 hours

CTS

ACTIONS (continued)

CTS	CONDITION	REQUIRED ACTION	COMPLETION TIME	
3.1.3.6 Action Note, 3.1.1.1 Action	C. D Regulating rod groups inserted in unacceptable operationa~~l~~ region.	C.1 D Initiate boration to restore SDM to within the limit specified in the COLR.	15 minutes	1 2
		AND		
		C.2.1 D Restore regulating rod groups to within restricted operat~~ing~~ ion region.	2 hours	1
		OR		
		C.2.2 D Reduce THERMAL POWER to less than or equal to the THERMAL POWER allowed by the restricted operation region of the regulating rod group insertion limits.	2 hours	1 3
3.1.3.6 tion te, 3.1.1.1 Action	D. E Required Action and associated Completion Time of Condition C or D not met.	D.1 E Be in MODE 3.	6 hours	1

SURVEILLANCE REQUIREMENTS

CTS	SURVEILLANCE		FREQUENCY
4.1.3.6, 4.1.1.1.1.b	SR 3.2.1.1	Verify regulating rod groups are within the sequence and overlap limits as specified in the COLR.	12 hours
4.1.3.6, 4.1.1.1.1.b	SR 3.2.1.2	Verify regulating rod groups meet the insertion limits as specified in the COLR.	12 hours
4.1.1.1.1.c	SR 3.2.1.3	Verify SDM is within the limit specified in the COLR.	Within 4 hours prior to achieving criticality

JUSTIFICATION FOR DEVIATIONS
ITS 3.2.1, REGULATING ROD INSERTION LIMITS

1. If the regulating rod groups are not within the sequence or overlap limits, ISTS 3.2.1 ACTION A allows up to 24 hours to restore the regulating rod groups to within the limits. This is an excessive time to allow the unit to operate outside these limits. Therefore, ITS ACTION C has been added to only allow 4 hours to restore the regulating rod groups to within the sequence and overlap limits. This is consistent with the Arkansas Nuclear One (ANO) ITS amendment, as approved by the NRC on October 29, 2001. Furthermore, consistent with ISTS 3.2.1 Required Action A.1, performance of SR 3.2.5.1 is required within 2 hours. Further performance of the SR (i.e., every 2 hours) is not required since the rods have to be restored within the limits by the time the next performance would be required. Due to this change, ISTS 3.2.1 Condition A has been modified to delete sequence and overlap references, and subsequent ACTIONS have been renumbered.

2. Changes are made to be consistent with the format of the ITS. The location of where a parameter's limits reside, whether in the COLR or an actual LCO statement, is not normally specified in the Required Action. The Required Action normally states that the parameter shall be "within limits."

3. Clarifying words have been added. Power only has to be reduced to exit the unacceptable operation region.

Improved Standard Technical Specifications (ISTS) Bases Markup and Justification for Deviations (JFDs)

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.1 Regulating Rod Insertion Limits

BASES

BACKGROUND

The insertion limits of the regulating rods are initial condition assumptions used in all safety analyses that assume rod insertion upon reactor trip. The insertion limits directly affect the core power distributions, the worth of a potential ejected rod, the assumptions of available SDM, and the initial reactivity insertion rate.

INSERT 1

The applicable criteria for these reactivity and power distribution design requirements are described in ~~10 CFR 50, Appendix A, GDC 10, "Reactor Design," GDC 26, "Reactivity Control System Redundancy and Capability," GDC 28, "Reactivity Limits"~~ (Ref. 1), and in 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Plants" (Ref. 2). 6

are specified in the COLR

Limits on regulating rod insertion ~~have been established~~, and all rod positions are monitored and controlled during power operation to ensure that the power distribution and reactivity limits defined by the design power peaking and SDM limits are not violated. 4

The regulating rod groups operate with a predetermined amount of position overlap ~~in order~~ to approximate a linear relation between rod worth and rod position (integral rod worth). To achieve this approximately linear relationship, the regulating rod groups are withdrawn and operated in a predetermined sequence. The automatic control system controls reactivity by moving the regulating rod groups in sequence within analyzed ranges. The group sequence and overlap limits are specified in the COLR. 7

The regulating rods are used for precise reactivity control of the reactor. The positions of the regulating rods are normally controlled automatically by the automatic control system but can also be controlled manually. They are capable of adding reactivity quickly compared with borating or diluting the Reactor Coolant System (RCS).

The power density at any point in the core must be limited to maintain specified acceptable fuel design limits, including limits that ensure that the criteria specified in 10 CFR 50.46 (Ref. 2) are not violated. Together, LCO 3.2.1, "Regulating Rod Insertion Limits," LCO 3.2.2, "AXIAL POWER SHAPING ROD (APSR) Insertion Limits," LCO 3.2.3, "AXIAL POWER

6 **INSERT 1**

UFSAR, Appendices 3D.1.6, 3D.1.21, 3D.1.22, 3D.1.23, and 3D.1.24

BASES

BACKGROUND (continued)

IMBALANCE Operating Limits," and LCO 3.2.4, "QUADRANT POWER TILT (QPT)," provide limits on control component operation and on monitored process variables to ensure that the core operates within the F_Q~~(Z)~~ and $F^N_{\Delta H}$ limits in the COLR. Operation within the F_Q~~(Z)~~ limits given in the COLR prevents power peaks that would exceed the loss of coolant accident (LOCA) linear heat rate (LHR) limits derived from the analysis of the Emergency Core Cooling Systems (ECCS). Operation within the $F^N_{\Delta H}$ limits given in the COLR prevents departure from nucleate boiling (DNB) during a loss of forced reactor coolant flow accident. In addition to the F_Q~~(Z)~~ and $F^N_{\Delta H}$ limits, certain reactivity limits are met by regulating rod insertion limits. The regulating rod insertion limits also restrict the ejected CONTROL ROD worth to the values assumed in the safety analysis and maintain the minimum required SDM in MODES 1 and 2. 1 9 1

This LCO is required to minimize fuel cladding failures that breach the primary fission product barrier and release fission products into the reactor coolant in the event of a LOCA, loss of flow accident, ejected rod accident, or other postulated accidents requiring termination by a Reactor Protection System trip function.

APPLICABLE SAFETY ANALYSES

The fuel cladding must not sustain damage as a result of normal operation (Condition 1) or anticipated operational occurrences (Condition 2). The LCOs governing regulating rod insertion, APSR position, AXIAL POWER IMBALANCE, and QPT preclude core power distributions that violate the following fuel design criteria:

a. During a ~~large break~~ LOCA, the peak cladding temperature must not exceed 2200°F (Ref. 2) ; 1 2

b. During a loss of forced reactor coolant flow accident, there must be at least 95% probability at the 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience a DNB condition (Ref. ~~1~~ 3) ; 2 1

c. During an ejected rod accident, the fission energy input to the fuel must not exceed 280 cal/gm (Ref. ~~3~~ 3) ; and 2 1

d. The CONTROL RODS must be capable of shutting down the reactor with a minimum required SDM with the highest worth CONTROL ROD stuck fully withdrawn (Ref. 1).

BASES

APPLICABLE SAFETY ANALYSES (continued)

Fuel cladding damage does not occur when the core is operated outside the conditions of these LCOs during normal operation. However, fuel cladding damage could result if an accident occurs with the simultaneous violation of one or more of the LCOs limiting the regulating rod position, the APSR position, the AXIAL POWER IMBALANCE, and the QPT. This potential for fuel cladding damage exists because changes in the power distribution can cause increased power peaking and correspondingly increased local linear ~~heat~~ rates [(LHRs)]. 7

The SDM requirement is met by limiting the regulating and safety rod insertion limits such that sufficient inserted reactivity is available in the rods to shut down the reactor to hot zero power with a reactivity margin that assumes that the maximum worth rod remains fully withdrawn upon trip (Ref. 4). Operation at the SDM based regulating rod insertion limit may also indicate that the maximum ejected rod worth could be equal to the limiting value.

beyond

Operation ~~at~~ the regulating rod insertion limits may cause the local core power to approach the maximum linear heat generation rate or peaking factor with the allowed QPT present. 1

The regulating rod and safety rod insertion limits ensure that the safety analysis assumptions for SDM, ejected rod worth, and power distribution peaking factors remain valid (Refs. ~~3, 5, and 6~~). 3, 4, and 5 1

The regulating rod insertion limits LCO satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

regulating rod

The limits on ~~CONTROL ROD~~ sequence, including group overlap, and insertion positions as defined in the COLR, must be maintained because they ensure that the resulting power distribution is within the range of analyzed power distributions and that the SDM and ejected rod worth are maintained. 1

The overlap between regulating groups provides more uniform rates of reactivity insertion and withdrawal and is imposed to maintain acceptable power peaking during regulating rod motion.

limits

Error adjusted ~~maximum allowable setpoints~~ for regulating rod insertion limits are provided in the COLR. The ~~setpoints~~ are derived by an adjustment of the measurement system independent limits to allow for THERMAL POWER level uncertainty and rod position errors. 1

BASES

LCO (continued)

~~Actual alarm setpoints implemented in the unit may be more restrictive than the maximum allowable setpoint values to provide additional conservatism between the actual alarm setpoint and the measurement system independent limit.~~ 8

LCO 3.2.1 has been modified by a Note that suspends the LCO requirement for those regulating rods not within the limits of the COLR solely due to testing in accordance with SR 3.1.4.2, which verifies the freedom of the rods to move. This SR may require the regulating rods to move below the LCO limit, which would otherwise violate the LCO.

APPLICABILITY

The regulating rod sequence, overlap, and physical insertion limits shall be maintained with the reactor in MODES 1 and 2. These limits maintain the validity of the assumed power distribution, ejected rod worth, SDM, and reactivity insertion rate assumptions used in the safety analyses. Applicability in MODES 3, 4, and 5 is not required, because neither the power distribution nor ejected rod worth assumptions are exceeded in these MODES. SDM in MODES 3, 4, and 5 is governed by LCO 3.1.1, "SHUTDOWN MARGIN (SDM)."

ACTIONS

The regulating rod insertion ~~alarm setpoints~~ limits provided in the COLR are based on both the initial conditions assumed in the accident analyses and on the SDM. Specifically, separate insertion limits are specified to determine whether the unit is operating in violation of the initial conditions (e.g., the range of power distributions) assumed in the accident analyses or whether the unit is in violation of the SDM or ejected rod worth limits. Separate insertion limits are provided because different Required Actions and Completion Times apply, depending on which insertion limit has been violated. The area between the boundaries of acceptable operation and unacceptable operation, illustrated on the regulating rod insertion limit figures in the COLR, is the restricted region. The actions required when operation occurs in the restricted region are described under Condition A. The actions required when operation occurs in the unacceptable region are described under Condition ~~C~~ D. The actions required when operation occurs with the regulating rod group sequence or overlap limits not met are described under Condition C. 1 3

A.1

Operation with the regulating rods in the restricted region shown on the regulating rod insertion figures specified in the COLR ~~or with any group sequence or overlap outside the limits specified in the COLR~~ potentially violates the LOCA LHR limits (F_Q~~(Z)~~ limits), or the loss of flow accident DNB peaking limits ($F^N_{\Delta H}$ limits). ~~The design calculations assume no~~ 3 1 7 3

BASES

ACTIONS (continued)

deviation in nominal overlap between regulating rod groups. However, deviations of 5% of the core height above or below the nominal overlap may be typical and do not cause significant differences in core reactivity, in power distribution, or in rod worth, relative to the design calculations. The group sequence must be maintained because design calculations assume the regulating rods withdraw and insert in a predetermined order. 3

For verification that $F_Q(Z)$ and $F^N_{\Delta H}$ are within their limits, SR 3.2.5.1 is performed using the Incore Detector System to obtain a three dimensional power distribution map. Verification that $F_Q(Z)$ and $F^N_{\Delta H}$ are within their limits ensures that operation with the regulating rods inserted into the restricted operation region does not violate the ECCS or DNB criteria (Ref. 6 ~~7~~). The required Completion Time of 2 hours is acceptable in that it allows the operator sufficient time for obtaining a power distribution map and for verifying the power peaking factors. Repeating SR 3.2.5.1 every 2 hours is acceptable because it ensures that continued verification of the power peaking factors is performed as core conditions (primarily regulating rod insertion and induced xenon redistribution) change. 1 1 4 1

Monitoring the power peaking factors $F_Q(Z)$ and $F^N_{\Delta H}$ does not provide verification that the reactivity insertion rate on the rod trip or the ejected rod worth limit is maintained, because worth is a reactivity parameter rather than a power peaking parameter. However, if the COLR figures do not show that a rod insertion limit is ejected rod worth limited, then the ejected rod worth is no more limiting than the SDM based rod insertion limit in the core design (Ref. 7 ~~8~~). Ejected rod worth limits are independently maintained by the Required Actions of Conditions A and D ~~C~~. 1 1 3

Required Action A.1 is modified by a Note that requires the performance of SR 3.2.5.1 only when THERMAL POWER is greater than 20% RTP. This establishes a Required Action that is consistent with the Applicability of LCO 3.2.5, "Power Peaking Factors."

A.2

Indefinite operation with the regulating rods inserted in the restricted region, or in violation of the group sequence or overlap limits, is not prudent. Even if power peaking monitoring per Required Action A.1 is continued, reactivity limits may not be met and the abnormal regulating rod insertion or group configuration may cause an adverse xenon redistribution, may cause the limits on AXIAL POWER IMBALANCE to be exceeded, or may adversely affect the long term fuel depletion pattern. 3

BASES

ACTIONS (continued)

restoration of the regulating rod groups to within limits is required within

Therefore, power peaking monitoring is allowed for up to 24 hours after discovery of failure to meet the requirements of this LCO. This required Completion Time is reasonable based on the low probability of an event occurring simultaneously with the limit out of specification in this relatively short time period. In addition, it precludes long term depletion with abnormal group insertions or configurations, thereby limiting the potential for an adverse xenon redistribution. 4

B.1

operation region

If the regulating rods cannot be restored within the acceptable operating limits shown on the figures in the COLR within the required Completion Time (i.e., Required Action A.2 not met), then the limits can be restored by reducing the THERMAL POWER to a value allowed by the regulating rod insertion limits in the COLR. The required Completion Time of 2 hours is sufficient to allow the operator to complete the power reduction in an orderly manner and without challenging the plant systems. Operation for up to 2 hours more in the restricted region shown in the COLR is acceptable, based on the low probability of an event occurring simultaneously with the limit out of specification in this relatively short time period. In addition, it precludes long term depletion with abnormal group insertions or configurations and limits the potential for an adverse xenon redistribution. 3 4 4

operation

insertion

INSERT 2 3

D

C.1 3

operation

Operation in the unacceptable region shown on the figures in the COLR corresponds to power operation with an SDM less than the minimum required value or with the ejected rod worth greater than the allowable value. The regulating rods may be inserted too far to provide sufficient negative reactivity insertion following a reactor trip and the ejected rod worth may exceed its initial condition limit. Therefore, the RCS boron concentration must be increased to restore the regulating rod insertion to a value that preserves the SDM and ejected rod worth limits. The RCS boration must occur as described in Section B 3.1.1. The required Completion Time of 15 minutes to initiate boration is reasonable, based on limiting the potential xenon redistribution, the low probability of an 4 7

the Bases of LCO 3.1.1

3 INSERT 2

C.1 and C.2

Operation with the regulating rod groups out of sequence or with the group overlap limits exceeded may represent a condition beyond the assumptions used in the safety analyses, including SDM. The design calculations assume no deviation in nominal overlap between regulating rod groups. However, deviations as allowed by the COLR above or below the nominal overlap may be typical and would not cause significant differences in core reactivity, in power distribution, or in rod worth, relative to the design calculations. The group sequence must be maintained because design calculations assume the regulating rods withdraw and insert in a predetermined order.

For verification that F_Q and $F^N_{\Delta H}$ are within their limits, SR 3.2.5.1 is performed using the Incore Detector System to obtain a three dimensional power distribution map. Verification that F_Q and $F^N_{\Delta H}$ are within their limits ensures that operation with the regulating rods sequence or overlap limits not met does not violate the ECCS or DNB criteria (Ref. 6). The required Completion Time of 2 hours is acceptable in that it allows the operator sufficient time for obtaining a power distribution map and for verifying the power peaking factors. Required Action C.1 is modified by a Note that requires the performance of SR 3.2.5.1 only when THERMAL POWER is greater than 20% RTP. This establishes a Required Action that is consistent with the Applicability of LCO 3.2.5.

Indefinite operation with the regulating rods sequence or overlap limits not met is not prudent because of the potential severity associated with gross violations of group sequence or overlap requirements. Therefore, the regulating rod groups must be restored to within the sequence and overlap limits within 4 hours. The 4 hour Completion Time is based on operating experience which supports the restoration time without unnecessarily challenging unit operation and the low probability of an event occurring simultaneously with the limit out of specification.

BASES

ACTIONS (continued)

accident occurring in this relatively short time period, and the number of steps required to complete this Action. This period allows the operator sufficient time for aligning the required valves and for starting the boric acid pumps. Boration continues until the regulating rod group positions are restored to at least within the restricted operational region, which restores the minimum SDM capability and reduces the potential ejected rod worth to within its limit.

D

C.2.1 3

The required Completion Time of 2 hours from initial discovery of a regulating rod group in the unacceptable region until its restoration to within the restricted operating region shown on the figures in the COLR allows sufficient time for borated water to enter the RCS from the chemical addition and makeup systems, thereby allowing the regulating rods to be withdrawn to the restricted region. Operation in the restricted region for up to an additional 2 hours is reasonable, based on limiting the potential for an adverse xenon redistribution, the low probability of an accident occurring in this relatively short time period, and the number of steps required to complete this Action.

operation 4

ion 3

unacceptable operation 4

D

C.2.2 3

The SDM and ejected rod worth limit can also be restored by reducing the THERMAL POWER to a value allowed by the regulating rod insertion limits in the COLR. The required Completion Time of 2 hours is sufficient to allow the operator to complete the power reduction in an orderly manner and without challenging the plant systems. Operation for up to 2 hours more in the restricted region shown in the COLR is acceptable, based on the low probability of an event occurring simultaneously with the limit out of specification in this relatively short time period. In addition, it precludes long term depletion with abnormal group insertions or configurations and limits the potential for an adverse xenon redistribution.

unacceptable operation 4

BASES

ACTIONS (continued)

E

D.1

any Required Action and associated Completion Time of Condition C or D is not met

4 3

If the regulating rods cannot be restored to within the acceptable operating limits for the original THERMAL POWER, or if the power reduction cannot be completed within the required Completion Time, then the reactor is placed in MODE 3, in which this LCO does not apply. This Action ensures that the reactor does not continue operating in violation of the peaking limits, the ejected rod worth, the reactivity insertion rate assumed as initial conditions in the accident analyses, or the required minimum SDM assumed in the accident analyses. The required Completion Time of 6 hours is reasonable, based on operating experience regarding the amount of time required to reach MODE 3 from RTP without challenging plant systems. 4

SURVEILLANCE REQUIREMENTS

SR 3.2.1.1

This Surveillance ensures that the sequence and overlap limits are not violated. A Surveillance Frequency of 12 hours is acceptable because little rod motion occurs in 12 hours due to fuel burnup and the probability of a deviation occurring simultaneously with an inoperable sequence monitor in this relatively short time frame is low. Also, the Frequency takes into account other information available in the control room for monitoring the status of the regulating rods. 4

SR 3.2.1.2

With an OPERABLE regulating rod insertion limit alarm, verification of the regulating rod insertion limits as specified in the COLR at a Frequency of 12 hours is sufficient to ensure the OPERABILITY of the regulating rod insertion limit alarm and to detect regulating rod banks that may be approaching the group insertion limits, because little rod motion due to fuel burnup occurs in 12 hours. Also, the Frequency takes into account other information available in the control room for monitoring the status of the regulating rods. 4 4

groups

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.2.1.3

Within 4 hours

Prior to achieving criticality, an estimated critical position for the CONTROL RODS is determined. Verification that SDM meets the minimum requirements ensures that sufficient SDM capability exists with the CONTROL RODS at the estimated critical position if it is necessary to shut down or trip the reactor after criticality. The Frequency of 4 hours prior to criticality provides sufficient time to verify SDM capability and establish the estimated critical position. 4

REFERENCES

1. ~~10 CFR 50, Appendix A, GDC 10 and GDC 26~~. 6

UFSAR Appendices 3D.1.6, Criterion 10 – Reactor Design; 3D.1.21, Criterion 25 – Protection System Requirements For Reactivity Control Malfunctions; 3D.1.22, Criterion 26 – Reactivity Control System Redundancy and Capability; 3D.1.23, Criterion 27 – Combined Reactivity Control Systems Capability; and 3D.1.24, Criterion 28 – Reactivity Limits

2. 10 CFR 50.46.
3. U FSAR, Section [ ] 15.4.3. 1 5
4. U FSAR, Section [ ] 15.1.2. 1 5
5. U FSAR, Section [ ] 15.2.3. 1 5
6. ~~FSAR, Section [ ]~~ BAW-10179P-A, "Safety Criteria and Methodology for Acceptance Cycle Reload Analyses" (revision specified in Specification 5.6.3). 1 5
7. ~~FSAR, Section [ ]~~ BAW-10122P-A, "Normal Operating Controls" (revision specified in Specification 5.6.3). 1 5
8. ~~FSAR, Section [ ]~~. 1

JUSTIFICATION FOR DEVIATIONS
ITS 3.2.1 BASES, REGULATING ROD INSERTION LIMITS

1. Changes are made (additions, deletions, and/or changes) to the ISTS Bases which reflect the plant specific nomenclature, number, reference, system description, analysis, or licensing basis description.

2. These punctuation corrections have been made consistent with the Writer's Guide for the Improved Standard Technical Specifications, TSTF-GG-05-01, Section 5.1.3.

3. Changes are made to reflect changes made to the Specification.

4. Changes are made to reflect the Specification.

5. The brackets have been removed and the proper plant specific information/value has been provided.

6. Davis-Besse was designed and under construction prior to the promulgation of 10 CFR 50, Appendix A. The design of Davis-Besse meets the intent of 10 CFR 50, Appendix A published in the Federal Register on February 20, 1971, and as amended in Federal Register on July 7, 1971. Bases references to the 10 CFR 50, Appendix A criteria have been replaced with references to the appropriate section of the UFSAR.

7. Editorial change corrected with no change in intent.

8. The ISTS 3.2.1 LCO Bases includes a discussion of "Actual Alarm Setpoints" for Regulating Rod insertion limits. This discussion is not included in the ITS LCO 3.2.1 Bases. The "Actual Alarm Setpoints" are not needed to satisfy the requirements of the LCO and therefore a discussion of the "Actual Alarm Setpoints" is not needed in the LCO Bases.

9. Changes are made to be consistent with other places in the Bases (i.e., LCO 3.2.5 Bases Background).

Specific No Significant Hazards Considerations (NSHCs)

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATIONS
ITS 3.2.1, REGULATING ROD INSERTION LIMITS

There are no specific NSHC discussions for this Specification.

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ATTACHMENT 2

ITS 3.2.2, AXIAL POWER SHAPING ROD (APSR) INSERTION LIMITS

Current Technical Specification (CTS) Markup and Discussion of Changes (DOCs)

ITS 3.2.2

ITS

A01

REACTIVITY CONTROL SYSTEMS

AXIAL POWER SHAPING ROD INSERTION LIMITS

LIMITING CONDITION FOR OPERATION

LCO 3.2.2 — 3.1.3.9 The axial power shaping rod group shall be within the acceptable operating limits for axial power shaping rod position specified in the CORE OPERATING LIMITS REPORT.

APPLICABILITY: MODES 1 and 2~~*~~. — M01

ACTION:

ACTION A — With the axial power shaping rod group outside the above insertion limits, either:

Add proposed Required Action A.1 — L01

a. Restore the axial power shaping rod group to within the limits within ~~2~~ 24 hours, or

~~b. Reduce THERMAL POWER to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the rod group position using the acceptable operating limits provided in the CORE OPERATING LIMITS REPORT within 2 hours, or~~ — A02

ACTION B — c. Be in at least HOT STANDBY within 6 hours.

SURVEILLANCE REQUIREMENTS

SR 3.2.2.1 — 4.1.3.9 The position of the axial power shaping rod group shall be determined to be within the limits provided in the CORE OPERATING LIMITS REPORT at least once every 12 hours~~, except when the axial power shaping rod insertion limit alarm is inoperable, then verify the group to be within the limit provided in the CORE OPERATING LIMITS REPORT at least once every 4 hours~~. — L02

~~*With $k_{eff} \geq 1.0$.~~ — M01

DAVIS-BESSE, UNIT 1 — 3/4 1-34 — Amendment No. ~~33,42,45,61,69,80,123~~,144

(Next page is 3/4 2-1)

DISCUSSION OF CHANGES
ITS 3.2.2, AXIAL POWER SHAPING ROD (APSR) INSERTION LIMITS

ADMINISTRATIVE CHANGES

A01 In the conversion of the Davis-Besse Current Technical Specifications (CTS) to the plant specific Improved Technical Specifications (ITS), certain changes (wording preferences, editorial changes, reformatting, revised numbering, etc.) are made to obtain consistency with NUREG-1430, Rev. 3.1, "Standard Technical Specifications-Babcock and Wilcox Plants" (ISTS).

These changes are designated as administrative changes and are acceptable because they do not result in technical changes to the CTS.

A02 In the event the APSRs are outside the operating limits specified in the CORE OPERATING LIMITS REPORT (COLR), CTS 3.1.3.9 Action b requires a reduction in THERMAL POWER to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the rod group position using the acceptable operating limits provided in the COLR within 2 hours, as one of three alternative actions. ITS 3.2.2 does not provide a comparable Required Action for this Condition. This change deletes the CTS Action to reduce THERMAL POWER to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the rod group position using the acceptable operating limits provided in the COLR within 2 hours, in the event that the APSRs are not within the limits provided in the COLR.

The COLR provides APSR insertion limits based on exposure. The APSR insertion limits are not based on THERMAL POWER. Therefore a reduction of the THERMAL POWER to less than or equal to that fraction of RATED THERMAL POWER which is allowed by the rod group position using the acceptable operating limits provided in the COLR is not an appropriate action. This change is designated as administrative because it does not result in a technical change to the CTS.

MORE RESTRICTIVE CHANGES

M01 The Applicability of CTS 3.1.3.9 is MODE 1 and MODE 2 with the Applicability in MODE 2 modified by a footnote, designated as "#," stating "With $k_{eff} \geq 1.0$." ITS 3.2.2 Applicability is MODE 1 and 2. The CTS is revised to delete the footnote.

The purpose of the footnote is to provide an allowance such that, when in MODE 2 with the reactor not critical, the APSR insertion limits are not applicable. This change provides a more restrictive requirement, in that the APSR insertion limits are now applicable at all times in MODE 2. This change is acceptable because applying that requirement prior to bringing the reactor critical ensures the APSR are in the correct position when required so that the axial fuel burnup design conditions assumed in the reload safety analyses will be satisfied. This change is designated as more restrictive because the Applicability has been broadened to encompass all of MODE 2.

DISCUSSION OF CHANGES
ITS 3.2.2, AXIAL POWER SHAPING ROD (APSR) INSERTION LIMITS

RELOCATED SPECIFICATIONS

None

REMOVED DETAIL CHANGES

None

LESS RESTRICTIVE CHANGES

L01 *(Category 3 – Relaxation of Completion Time)* In the event the APSRs are outside the operating limits specified in the COLR, CTS 3.1.3.9 Action a requires the APSRs to be restored to within the limits within 2 hours, as one of three alternative actions. ITS 3.2.2 ACTION A provides a 24 hour Completion Time to restore the APSRs to within limits and requires the performance of SR 3.2.5.1 (Verify F_Q and $F^N_{\Delta H}$ are within limits by using the Incore Detector System to obtain a power distribution map) when THERMAL POWER is > 20% RTP once per 2 hours. This changes the CTS by extending the Completion Time from "2 hours" to "24 hours" and provides a requirement to verify F_Q and $F^N_{\Delta H}$ are within their limits once per 2 hours.

The purpose of the CTS 3.1.3.9 Action a is to ensure that the APSRs are restored so that the axial burnup distribution that accumulates in the fuel will be consistent with the expected (as designed) distribution. This change is acceptable because the Completion Time is consistent with safe operation under the specified Condition. This change extends the Completion Time to restore APSRs to within insertion limits from "2 hours" to "24 hours" and provides a requirement to verify F_Q and $F^N_{\Delta H}$ are within their limits once per 2 hours. Successful verification that F_Q and $F^N_{\Delta H}$ are within their limits ensures that operation with the APSRs inserted or withdrawn in violation of the times specified in the COLR do not violate either the ECCS or DNB criteria. The required Completion Time of 2 hours is reasonable to allow the operator to obtain a power distribution map and to verify the power peaking factors. Repeating SR 3.2.5.1 every 2 hours is reasonable to ensure that continued verification of the power peaking factors is obtained as core conditions (primarily the regulating rod insertion and induced xenon redistribution) change. Required Action A.1 is modified by a Note that requires the performance of SR 3.2.5.1 only when THERMAL POWER is greater than 20% RTP. This establishes a Required Action that is consistent with the Applicability of LCO 3.2.5, "Power Peaking Factors." Indefinite operation with the APSRs inserted or withdrawn in violation of the times specified in the COLR is not prudent. Even if power peaking monitoring is continued, the abnormal APSR insertion or withdrawal may cause an adverse xenon redistribution, may cause the limits on AXIAL POWER IMBALANCE to be exceeded, or may affect the long term fuel depletion pattern. Therefore, power peaking monitoring is allowed for up to 24 hours. This required Completion Time is reasonable based on the low probability of an event occurring simultaneously with the APSR limit out of specification. In addition, it

DISCUSSION OF CHANGES
ITS 3.2.2, AXIAL POWER SHAPING ROD (APSR) INSERTION LIMITS

precludes long term depletion with the APSRs in positions that have not been analyzed, thereby limiting the potential for an adverse xenon redistribution. This time limit also ensures that the intended burnup distribution is maintained, and allows the operator sufficient time to reposition the APSRs to correct their positions. This change is designated as less restrictive because additional time is allowed to restore parameters to within the LCO limits than was allowed in the CTS.

L02 *(Category 7 – Relaxation of Surveillance Frequency - Non-24 Month Type Change)* CTS 4.1.3.9 requires the position of the APSR group to be determined to be within the limits provided in the CORE OPERATING LIMITS REPORT (COLR) at least once every 12 hours except during time intervals when the APSR insertion limit alarm is inoperable. With this alarm inoperable, CTS 4.1.3.9 requires the verification that the group is within the limit provided in the COLR at least once per 4 hours. ITS SR 3.2.2.1 requires verification that APSRs are within the acceptable limits specified in the COLR every 12 hours. This changes the CTS by eliminating the requirement to verify that the APSR group is within the limits provided in the COLR at least once per 4 hours when the APSR insertion limit alarm is inoperable.

The purpose of CTS 4.1.3.9 is to periodically verify that the APSRs are within the limits specified in the LCO. This change is acceptable because increasing the Frequency of APSR insertion limit verification when the APSR insertion limit alarm is inoperable is unnecessary. An inoperability of the alarm does not increase the probability that the APSR insertion limits are not met. The routine 12 hour Frequency (ITS SR 3.2.2.1) continues to ensure the APSR insertion limits are met. Furthermore, the APSR insertion limit alarm is for indication only. Its use is not credited in any safety analyses. Thus, any response determined necessary by plant personnel due to an inoperable alarm is more appropriately controlled by plant procedures, not Technical Specifications. This change is designated as less restrictive because Surveillances will be performed less frequently under the ITS than under the CTS.

Improved Standard Technical Specifications (ISTS) Markup and Justification for Deviations (JFDs)

CTS

3.2 POWER DISTRIBUTION LIMITS

3.2.2 AXIAL POWER SHAPING ROD (APSR) Insertion Limits

3.1.3.9 LCO 3.2.2 APSRs shall be positioned within the limits specified in the COLR.

APPLICABILITY: MODES 1 and 2.

ACTIONS

CTS	CONDITION	REQUIRED ACTION	COMPLETION TIME
3.1.3.9 Action a	A. APSRs not within limits.	A.1 --------------NOTE-------------- Only required when THERMAL POWER is > 20% RTP. ------------------------------------- Perform SR 3.2.5.1.	Once per 2 hours
		AND	
		A.2 Restore APSRs to within limits.	24 hours
3.1.3.9 Action c	B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

CTS	SURVEILLANCE		FREQUENCY
4.1.3.9	SR 3.2.2.1	Verify APSRs are within acceptable limits specified in the COLR.	12 hours

JUSTIFICATION FOR DEVIATIONS
ITS 3.2.2, AXIAL POWER SHAPING ROD (APSR) INSERTION LIMITS

None

Improved Standard Technical Specifications (ISTS) Bases Markup and Justification for Deviations (JFDs)

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.2 AXIAL POWER SHAPING ROD (APSR) Insertion Limits

BASES

BACKGROUND

The insertion limits of the APSRs are initial condition assumptions in all safety analyses that are affected by core power distributions. The applicable criterion for these power distribution design requirements are 10 CFR 50, ~~Appendix A, GDC~~ 10, "Reactor Design" (Ref. 1), and 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Plants" (Ref. 2). UFSAR, Appendices 3D.1.6 and 3D.1.22 5

are specified in the COLR

Limits on APSR insertion ~~have been established~~, and all APSR positions are monitored and controlled during power operation to ensure that the power distribution defined by the design power peaking limits is maintained. 3

The power density at any point in the core must be limited to maintain specified acceptable fuel design limits, including limits that meet the criteria specified in Reference 2. Together, LCO 3.2.1, "Regulating Rod Insertion Limits," LCO 3.2.2, "AXIAL POWER SHAPING ROD (APSR) Insertion Limits," LCO 3.2.3, "AXIAL POWER IMBALANCE Operating Limits," and LCO 3.2.4, "QUADRANT POWER TILT (QPT)," provide limits on control component operation and on monitored process variables to ensure that the core operates within the $F_Q(\cancel{Z})$ and $F^N_{\Delta H}$ limits in the COLR. Operation within the $F_Q(\cancel{Z})$ limits given in the COLR prevents power peaks that exceed the loss of coolant accident (LOCA) linear heat rate (LHR) limits derived from the analysis of the Emergency Core Cooling Systems (ECCS). Operation within the $F^N_{\Delta H}$ limits given in the COLR prevents departure from nucleate boiling (DNB) during a loss of forced reactor coolant flow accident. The APSRs are not required for reactivity insertion rate on trip or SDM and, therefore, they do not trip upon a reactor trip. 1 7

This LCO is required to minimize fuel cladding failures that would breach the primary fission product barrier and release fission products to the reactor coolant in the event of a LOCA, loss of flow accident, ejected rod accident, or other postulated accident requiring termination by a Reactor Protection System trip function.

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BASES

APPLICABLE SAFETY ANALYSES

The fuel cladding must not sustain damage as a result of normal operation (Condition 1) or anticipated operational occurrences (Condition 2). Acceptance criteria for the safety and regulating rod insertion, APSR position, AXIAL POWER IMBALANCE, and QPT LCOs preclude core power distributions that violate the following fuel design criteria:

a. During a ~~large break~~ LOCA, the peak cladding temperature must not exceed 2200°F (Ref. 2). ; 1 2

b. During a loss of forced reactor coolant flow accident, there must be at least 95% probability at the 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience a DNB condition. ; (Ref. 1) 2 1

c. During an ejected rod accident, the fission energy input to the fuel must not exceed 280 cal/gm (Ref. 3). ~~and~~ ; 2

d. CONTROL RODS must be capable of shutting down the reactor with a minimum required SDM with the highest worth CONTROL ROD stuck fully withdrawn (~~GDC 26,~~ Ref. 1). 4 1

Fuel cladding damage does not occur when the core is operated outside these LCOs during normal operation. However, fuel cladding damage could result should an accident occur simultaneously with violation of one or more of these LCOs. This potential for fuel cladding damage exists because changes in the power distribution can cause increased power peaking and corresponding increased local ~~linear heat rates~~ LHRs. 1

Operation at the APSR insertion limits may approach the maximum allowable linear heat generation rate or peaking factor with the allowed QPT present.

The APSR insertion limits satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii).

BASES

LCO

The limits on APSR physical insertion as defined in the COLR must be maintained because they serve the function of controlling the power distribution within an acceptable range.

The fuel cycle design assumes APSR withdrawal at the effective full power days (EFPD) burnup window specified in the COLR. Prior to this window, the APSRs ~~cannot be maintained fully withdrawn in steady state operation~~ are maintained in accordance with the rod operation recommendations. After this window, the APSRs are not allowed to be reinserted for the remainder of the fuel cycle. 1

Error adjusted ~~maximum allowable setpoints~~ limits for APSR insertion are provided in the COLR. The ~~setpoints~~ limits are derived by adjustment of the measurement system independent limits to allow for THERMAL POWER level uncertainty and rod position errors. 1

~~Actual alarm setpoints implemented in the unit may be more restrictive than the maximum allowable setpoint values to allow for additional conservatism between the actual alarm setpoints and the measurement system independent limits.~~ 6

APPLICABILITY

The APSR physical insertion limits shall be maintained with the reactor in MODES 1 and 2. These limits maintain the power distribution within the range assumed in the accident analyses. ~~In MODE 1, the limits on APSR insertion specified by this LCO maintain the axial fuel burnup design conditions assumed in the reload safety evaluation analysis. In MODE 2, applicability is required because $k_{eff} \geq 0.99$.~~ Applicability in MODES 3, 4, and 5 is not required, because the power distribution assumptions in the accident analyses would not be exceeded in these MODES. 1

ACTIONS

For steady state power operation, a normal position for APSR insertion is specified in the ~~station operating procedures~~ rod operation recommendations. The APSRs may be positioned as necessary for transient AXIAL POWER IMBALANCE control until the fuel cycle design requires them to be fully withdrawn. (Not all fuel cycles may incorporate APSR withdrawal.) APSR ~~position~~ insertion limits are not imposed for gray APSRs, with two exceptions. If the fuel cycle design incorporates an APSR withdrawal (usually near end of cycle (EOC)), the APSRs ~~may not be maintained in the fully withdrawn position prior to the fuel cycle burnup for the APSR withdrawal. If this occurs, the APSRs must be restored to their normal inserted position~~ are positioned as allowed in the rod operation recommendations before the withdrawal occurs. Conversely, after the fuel cycle burnup for the APSR withdrawal occurs, the APSRs may not be reinserted for the remainder of the fuel cycle. These restrictions apply to ensure the axial burnup distribution that accumulates in the fuel will be consistent with the expected (as designed) distribution. 1 3 1

BASES

ACTIONS (continued)

A.1

For verification that the core parameters $F_Q(Z)$ and $F^N_{\Delta H}$ are within their limits, SR 3.2.5.1 is performed using the Incore Detector System to obtain a three dimensional power distribution map. Successful verification that $F_Q(Z)$ and $F^N_{\Delta H}$ are within their limits ensures that operation with the APSRs inserted or withdrawn in violation of the times specified in the COLR do not violate either the ECCS or DNB criteria (Ref. 4). The required Completion Time of 2 hours is reasonable to allow the operator to obtain a power distribution map and to verify the power peaking factors. Repeating SR 3.2.5.1 every 2 hours is reasonable to ensure that continued verification of the power peaking factors is obtained as core conditions (primarily the regulating rod insertion and induced xenon redistribution) change. 8 8 5 1

Required Action A.1 is modified by a Note that requires the performance of SR 3.2.5.1 only when THERMAL POWER is greater than 20% RTP. This establishes a Required Action that is consistent with the Applicability of LCO 3.2.5, "Power Peaking Factors."

A.2

Indefinite operation with the APSRs inserted or withdrawn in violation of the times specified in the COLR is not prudent. Even if power peaking monitoring per Required Action A.1 is continued, the abnormal APSR insertion or withdrawal may cause an adverse xenon redistribution, may cause the limits on AXIAL POWER IMBALANCE to be exceeded, or may affect the long term fuel depletion pattern. Therefore, power peaking monitoring is allowed for up to 24 hours. This required Completion Time is reasonable based on the low probability of an event occurring simultaneously with the APSR limit out of specification. In addition, it precludes long term depletion with the APSRs in positions that have not been analyzed, thereby limiting the potential for an adverse xenon redistribution. This time limit also ensures that the intended burnup distribution is maintained, and allows the operator sufficient time to reposition the APSRs to correct their positions.

Because the APSRs are not operated by the automatic control system, manual action by the operator is required to restore the APSRs to the positions specified in the COLR.

BASES

ACTIONS (continued)

B.1

any Required Action and associated Completion Time is not met

If ~~the APSRs cannot be restored to their intended positions within the required Completion Time of 24 hours~~, the reactor must be placed in MODE 3, in which this LCO does not apply. This action ensures that the fuel does not continue to be depleted in an unintended burnup distribution. The required Completion Time of 6 hours is reasonable, based on operating experience regarding the time required to reach MODE 3 from RTP in an orderly manner and without challenging plant systems. (3)

SURVEILLANCE REQUIREMENTS

SR 3.2.2.1

Fuel cycle designs that allow APSR withdrawal near EOC do not permit reinsertion of APSRs after the time of withdrawal. ~~When the plant computer is OPERABLE, the operator will receive a computer alarm if the APSRs insert after that time in core life when the APSR withdrawal occurs.~~ (1) Verification that the APSRs are within their insertion limits at a 12 hour Frequency is sufficient to ensure that the APSR insertion limits are preserved ~~and the computer alarm remains OPERABLE~~. (1) The 12 hour Frequency required for performing this verification is sufficient because APSRs are positioned by manual control and are normally moved infrequently. ~~The probability of a deviation occurring simultaneously with an inoperable computer alarm is low in this relatively short time frame. Also,~~ (1) the Frequency takes into account other information available in the control room for monitoring the axial power distribution in the reactor core.

REFERENCES

1. ~~10 CFR 50, Appendix A, GDC 10 and GDC 26~~. (5)

UFSAR, Appendices 3D.1.6, Criterion 10 – Reactor Design and 3D.1.22, Criterion 26 – Reactivity Control System Redundancy and Capability

2. 10 CFR 50.46.

U

3. FSAR, ~~Chapter [ ]~~. Section 15.4.3 (1) (4)

4. UFSAR, Appendix 3D.1.23.

5

~~4~~. ~~FSAR, Chapter [ ]~~. (1)

BAW-10179P-A, "Safety Criteria and Methodology for Acceptance Cycle Reload Analyses" (revision specified in Specification 5.6.3)

JUSTIFICATION FOR DEVIATIONS
ITS 3.2.2 BASES, AXIAL POWER SHAPING ROD (APSR) INSERTION LIMITS

1. Changes are made (additions, deletions, and/or changes) to the ISTS Bases which reflect the plant specific nomenclature, number, reference, system description, analysis, or licensing basis description.

2. These punctuation corrections have been made consistent with the Writer's Guide for the Improved Standard Technical Specifications, TSTF-GG-05-01, Section 5.1.3.

3. Changes are made to reflect the Specification.

4. The brackets have been removed and the proper plant specific information/value has been provided.

5. Davis-Besse was designed and under construction prior to the promulgation of 10 CFR 50, Appendix A. The design of Davis-Besse meets the intent of 10 CFR 50, Appendix A published in the Federal Register on February 20, 1971, and as amended in Federal Register on July 7, 1971. Bases references to the 10 CFR 50, Appendix A criteria have been replaced with references to the appropriate section of the UFSAR.

6. The ISTS LCO 3.2.2 Bases includes a discussion of "Actual Alarm Setpoints" for APSR insertion limits. This discussion is not included in the ITS LCO 3.2.2 Bases. The "Actual Alarm Setpoints" are not needed to satisfy the requirements of the LCO and therefore a discussion of the "Actual Alarm Setpoints" is not needed in the LCO Bases.

7. Changes are made to be consistent with other places in the Bases (i.e., LCO 3.2.5 Bases Background).

8. Changes are made to reflect changes made to the Specification.

Specific No Significant Hazards Considerations (NSHCs)

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATIONS
ITS 3.2.2, AXIAL POWER SHAPING ROD (APSR) INSERTION LIMITS

There are no specific NSHC discussions for this Specification.

ATTACHMENT 3

ITS 3.2.3, AXIAL POWER IMBALANCE OPERATING LIMITS

Current Technical Specification (CTS) Markup and Discussion of Changes (DOCs)

ITS 3.2.3

ITS

A01

3/4.2 POWER DISTRIBUTION LIMITS

AXIAL POWER IMBALANCE

LIMITING CONDITION FOR OPERATION

LCO 3.2.3 — 3.2.1 AXIAL POWER IMBALANCE shall be maintained within the acceptable AXIAL POWER IMBALANCE operating limits provided in the CORE OPERATING LIMITS REPORT.

APPLICABILITY: MODE 1 above 40% of RATED THERMAL POWER.~~*~~ — A02

ACTION:

Add proposed Required Action A.1 — L01

ACTION A — With AXIAL POWER IMBALANCE exceeding the limits specified above, either:

a. Restore the AXIAL POWER IMBALANCE to within the limits provided in the CORE OPERATING LIMITS REPORT within ~~15 minutes~~ 24 hours, or

ACTION B — b. Within ~~one hour~~ two hours reduce power until imbalance limits provided in the CORE OPERATING LIMITS REPORT are met or to 40% of RATED THERMAL POWER or less. — L02

SURVEILLANCE REQUIREMENTS

SR 3.2.3.1 — 4.2.1 The AXIAL POWER IMBALANCE shall be determined to be within the limits provided in the CORE OPERATING LIMITS REPORT at least once every 12 hours when above 40% of RATED THERMAL POWER ~~except when the AXIAL POWER IMBALANCE alarm is inoperable, then calculate the AXIAL POWER IMBALANCE at least once per hour.~~ — L03

~~*See Special Test Exception 3.10.1.~~ — A02

DAVIS-BESSE, UNIT 1 3/4 2-1 Amendment No. ~~33,42,45,61,69,~~ ~~80,123,~~ 144
(Next page is 3/4 2-5)

DISCUSSION OF CHANGES
ITS 3.2.3, AXIAL POWER IMBALANCE OPERATING LIMITS

ADMINISTRATIVE CHANGES

A01 In the conversion of the Davis-Besse Current Technical Specifications (CTS) to the plant specific Improved Technical Specifications (ITS), certain changes (wording preferences, editorial changes, reformatting, revised numbering, etc.) are made to obtain consistency with NUREG-1430, Rev. 3.1, "Standard Technical Specifications-Babcock and Wilcox Plants" (ISTS).

These changes are designated as administrative changes and are acceptable because they do not result in technical changes to the CTS.

A02 The Applicability of CTS 3.2.1 is MODE 1 above 40% RATED THERMAL POWER with footnote * stating "See Special Test Exception 3.10.1." ITS 3.2.3 Applicability is MODE 1 above 40% RATED THERMAL POWER and does not contain the footnote or a reference to the Special Test Exception. This changes the CTS by deleting explicit reference to the Special Test Exception.

The purpose of the footnote reference is to alert the user that a Special Test Exception exists that may modify the Applicability of the Specification. It is an ITS convention to not include these types of footnotes or cross-references. This change is designated as administrative as it incorporates an ITS convention with no technical change to the CTS.

MORE RESTRICTIVE CHANGES

None

RELOCATED SPECIFICATIONS

None

REMOVED DETAIL CHANGES

None

LESS RESTRICTIVE CHANGES

L01 *(Category 3 – Relaxation of Completion Time)* CTS 3.2.1 Action a requires the restoration of AXIAL POWER IMBALANCE to be within limits within 15 minutes. ITS 3.2.3 ACTION A requires the performance of ITS SR 3.2.5.1 (Verify F_Q and $F^N_{\Delta H}$ are within limits by using the Incore Detector System to obtain a power distribution map) once per 2 hours and the restoration of the AXIAL POWER IMBALANCE to within limits within 24 hours. This changes the CTS by extending the Completion Time from "15 minutes" to "24 hours" and provides a requirement to verify F_Q and $F^N_{\Delta H}$ are within their limits once per 2 hours.

DISCUSSION OF CHANGES
ITS 3.2.3, AXIAL POWER IMBALANCE OPERATING LIMITS

The purpose of CTS 3.2.1 Action a is to restore AXIAL POWER IMBALANCE to ensure that the axial burnup distribution that accumulates in the fuel will be consistent with the expected (as designed) distribution. This change is acceptable because the Completion Time is consistent with safe operation under the specified Condition, considering a reasonable time for restoration and the low probability of a DBA occurring during the allowed Completion Time. This changes the CTS by extending the Completion Time to restore AXIAL POWER IMBALANCE operating limits from “15 minutes” to “24 hours” and provides a requirement to verify F_Q and $F^N_{\Delta H}$ are within their limits once per 2 hours. The AXIAL POWER IMBALANCE operating limits that maintain the validity of the assumptions regarding the power distributions in the accident analyses of the LOCA and the loss of flow accident are provided in the COLR. Operation within the AXIAL POWER IMBALANCE limits given in the COLR is the acceptable region of operation. Operation in violation of the AXIAL POWER IMBALANCE limits given in the COLR is the restricted region of operation. Operation with AXIAL POWER IMBALANCE in the restricted region shown on the AXIAL POWER IMBALANCE figures in the COLR potentially violates the LOCA LHR limits (F_Q limits) or the loss of flow accident DNB peaking limits $F^N_{\Delta H}$ limits) or both. For verification that F_Q and $F^N_{\Delta H}$ are within their specified limits, SR 3.2.5.1 is performed using the Incore Detector System to obtain a three dimensional power distribution map. Verification that F_Q and $F^N_{\Delta H}$ are within their specified limits ensures that operation with the AXIAL POWER IMBALANCE in the restricted region does not violate the ECCS or 95/95 DNB criteria. The required Completion Time of 2 hours provides reasonable time for the operator to obtain a power distribution map and to determine and verify that the power peaking factors are within their specified limits. The 2 hour Frequency provides reasonable time to ensure that continued verification of the power peaking factors is obtained as core conditions (primarily regulating rod insertion and induced xenon redistribution) change, because little rod motion occurs in 2 hours due to fuel burnup, the potential for xenon redistribution is limited, and the probability of an event occurring in this short time frame is low. Indefinite operation with the AXIAL POWER IMBALANCE in the restricted region is not prudent. Even if power peaking monitoring per Required Action A.1 is continued, excessive AXIAL POWER IMBALANCE over an extended period of time may cause a potentially adverse xenon redistribution to occur. Therefore, power peaking monitoring is only allowed for a maximum of 24 hours. This required Completion Time is reasonable based on the low probability of a limiting event occurring simultaneously with the AXIAL POWER IMBALANCE outside the limits of this LCO. In addition, this limited Completion Time precludes long term depletion of the reactor fuel with excessive AXIAL POWER IMBALANCE and gives the operator sufficient time to reposition the APSRs or regulating rods to reduce the AXIAL POWER IMBALANCE because adverse effects of xenon redistribution and fuel depletion are limited. This change is designated as less restrictive because additional time is allowed to restore AXIAL POWER IMBALANCE to within the LCO limits than was allowed in the CTS.

L02 *(Category 3 – Relaxation of Completion Time)* In the event the AXIAL POWER IMBALANCE exceeds the limits, CTS 3.2.1 Action b requires power to be reduced until the imbalance limits are met or to be $\leq$ 40% RTP within one hour, as one of two alternative actions. ITS 3.2.3, Required Action B.1 requires

DISCUSSION OF CHANGES
ITS 3.2.3, AXIAL POWER IMBALANCE OPERATING LIMITS

THERMAL POWER to be reduced to ≤ 40% RTP within 2 hours if the Required Actions and Completion Times of Condition A (AXIAL POWER IMBALANCE not within limits) are not met. This change revises the CTS Action by extending the total time allowed to reduce THERMAL POWER to ≤ 40% RTP from 1 hour to 26 hours (the Required Actions of ITS 3.2.3 Condition A provides a 24 hour Completion Times prior to Condition B being entered). The justification for the Completion Time of 24 hours is discussed in Discussion of Change L01.

The purpose of the CTS 3.2.1 Action b is to ensure that the AXIAL POWER IMBALANCE is restored so that the assumptions regarding the power distributions in the accident analyses are valid or to be in a condition where the AXIAL POWER IMBALANCE limits are not applicable. This change is acceptable because the Completion Time is consistent with safe operation under the specified Condition, considering the OPERABLE status of the redundant systems or features. This includes the capacity and capability of remaining systems or features, a reasonable time for repairs or replacement, and the low probability of a DBA occurring during the allowed Completion Time. This change revises the CTS Action by extending the total time allowed to reduce THERMAL POWER to ≤ 40% RTP from 1 hour to 26 hours (the Required Actions of ITS 3.2.3 Condition A provides a 24 hour Completion Times prior to Condition B being entered). The acceptability of the 24 hours Completion Time is justified in DOC L01. This change is concerned with the relaxation of the Completion Time to reach 40% RTP from "one hour" to "2 hours." The revised Completion Time allows reactor power to be reduced in a controlled manner without challenging operators or plant systems. This change is designated as less restrictive because additional time is allowed to reduce power than was allowed in the CTS.

L03 *(Category 7 – Relaxation of Surveillance Frequency - Non-24 Month Type Change)* CTS 4.2.1 requires the AXIAL POWER IMBALANCE to be determined to be within operating limits at least once every 12 hours except during time intervals when the AXIAL POWER IMBALANCE alarm is inoperable. With this alarm inoperable, CTS 4.2.1 requires the verification that AXIAL POWER IMBALANCE is within limits at least once per hour. ITS SR 3.2.3.1 requires verification that AXIAL POWER IMBALANCE is within limits every 12 hours. This changes the CTS by eliminating the requirement to verify that AXIAL POWER IMBALANCE is within the limits at least once per hour when the AXIAL POWER IMBALANCE alarm is inoperable.

The purpose of CTS 4.2.1 is to periodically verify that the AXIAL POWER IMBALANCE is within the limits. This change is acceptable because increasing the Frequency of AXIAL POWER IMBALANCE operating limit verification when the AXIAL POWER IMBALANCE alarm is inoperable is unnecessary. An inoperability of the alarm does not increase the probability that the AXIAL POWER IMBALANCE limits are not met. The routine 12 hour Frequency (ITS SR 3.2.3.1) continues to ensure the AXIAL FLUX IMBALANCE limits are met. Furthermore, the AXIAL POWER IMBALANCE limit alarm is for indication only. Its use is not credited in any safety analyses. Thus, any response determined necessary by plant personnel due to an inoperable alarm is more appropriately controlled by plant procedures, not Technical Specifications. This change is

DISCUSSION OF CHANGES
ITS 3.2.3, AXIAL POWER IMBALANCE OPERATING LIMITS

designated as less restrictive because Surveillances will be performed less frequently under the ITS than under the CTS.

Improved Standard Technical Specifications (ISTS) Markup and Justification for Deviations (JFDs)

CTS

3.2 POWER DISTRIBUTION LIMITS

3.2.3 AXIAL POWER IMBALANCE Operating Limits

3.2.1 LCO 3.2.3 AXIAL POWER IMBALANCE shall be maintained within the limits specified in the COLR.

APPLICABILITY: MODE 1 with THERMAL POWER > 40% RTP.

ACTIONS

CTS	CONDITION	REQUIRED ACTION	COMPLETION TIME
3.2.1 Action a	A. AXIAL POWER IMBALANCE not within limits.	A.1 Perform SR 3.2.5.1.	Once per 2 hours
		AND	
		A.2 Reduce AXIAL POWER IMBALANCE within limits.	24 hours
3.2.1 Action b	B. Required Action and associated Completion Time not met.	B.1 Reduce THERMAL POWER to ≤ 40% RTP.	2 hours

SURVEILLANCE REQUIREMENTS

CTS	SURVEILLANCE		FREQUENCY
4.2.1	SR 3.2.3.1	Verify AXIAL POWER IMBALANCE is within limits as specified in the COLR.	12 hours

JUSTIFICATION FOR DEVIATIONS
ITS 3.2.3, AXIAL POWER IMBALANCE OPERATING LIMITS

None.

Improved Standard Technical Specifications (ISTS) Bases Markup and Justification for Deviations (JFDs)

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.3 AXIAL POWER IMBALANCE Operating Limits

BASES

BACKGROUND

This LCO is required to limit the core power distribution based on accident initial condition criteria.

The power density at any point in the core must be limited to maintain specified acceptable fuel design limits, including limits that satisfy the criteria specified in 10 CFR 50.46 (Ref. 1). This LCO provides limits on AXIAL POWER IMBALANCE to ensure that the core operates within the $F_Q(\boxed{Z})$ and $F^N_{\Delta H}$ limits given in the COLR. Operation within the $F_Q(\boxed{Z})$ limits 4
given in the COLR prevents power peaks that exceed the loss of coolant
linear heat rate (LHR) accident (LOCA) limits derived from the analysis of the Emergency Core 6
Cooling Systems (ECCS). Operation within the $F^N_{\Delta H}$ limits given in the COLR prevents departure from nucleate boiling (DNB) during a loss of forced reactor coolant flow accident.

This LCO is required to limit fuel cladding failures that breach the primary fission product barrier and release fission products into the reactor coolant in the event of a LOCA, loss of forced reactor coolant flow accident, or other postulated accident requiring termination by a Reactor Protection System trip function. This LCO limits the amount of damage to the fuel cladding during an accident by maintaining the validity of the assumptions in the safety analyses related to the initial power distribution and reactivity.

Fuel cladding failure during a postulated LOCA is limited by restricting the maximum linear heat rate (LHR) so that the peak cladding temperature does not exceed 2200°F (Ref. 2). Peak cladding temperatures > 2200°F cause severe cladding failure by oxidation due to a Zircaloy water reaction. Other criteria must also be met (e.g., maximum cladding oxidation, maximum hydrogen generation, coolable geometry, and long term cooling). However, peak cladding temperature is usually most limiting.

Proximity to the DNB condition is expressed by the departure from nucleate boiling ratio (DNBR), defined as the ratio of the cladding surface heat flux required to cause DNB to the actual cladding surface heat flux. The minimum DNBR value during both normal operation and anticipated transients is limited to the DNBR correlation limit for the particular fuel design in use and is accepted as an appropriate margin to DNB. The DNB correlation limit ensures that there is at least 95% probability at the 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience DNB.

BASES

BACKGROUND (continued)

The measurement system independent limits on AXIAL POWER IMBALANCE are determined directly by the reload safety evaluation analysis without adjustment for measurement system error and uncertainty. Operation beyond these limits could invalidate the assumptions used in the accident analyses regarding the core power distribution.

APPLICABLE SAFETY ANALYSES

The fuel cladding must not sustain damage as a result of normal operation (Condition 1) and anticipated operational occurrences (Condition 2). The LCOs based on power distribution, LCO 3.2.1, "Regulating Rod Insertion Limits," LCO 3.2.2, "AXIAL POWER SHAPING ROD (APSR) Insertion Limits," LCO 3.2.3, "AXIAL POWER IMBALANCE Operating Limits," and LCO 3.2.4, "QUADRANT POWER TILT (QPT)," preclude core power distributions that would violate the following fuel design criteria:

a. During a ~~large break~~ LOCA, peak cladding temperature must not exceed 2200°F (Ref. 1). ; 4 1

b. During a loss of forced reactor coolant flow accident, there must be at least a 95% probability at the 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience a DNB condition. ; 2

INSERT 1

The regulating rod positions, the APSR positions, the AXIAL POWER IMBALANCE, and the QPT are process variables that characterize and control the three dimensional power distribution of the reactor core.

Fuel cladding damage does not occur when the core is operated outside this LCO during normal operation. However, fuel cladding damage could result should an accident occur with simultaneous violation of one or more of the LCOs governing the four process variables cited above. This potential for fuel cladding damage exists because changes in the power distribution can cause increased power peaking and corresponding increased local LHRs.

2 **INSERT 1**

c. During an ejected rod accident, the fission energy input to the fuel must not exceed 280 cal/gm (Ref. 3); and

d. The CONTROL RODS must be capable of shutting down the reactor with a minimum required SDM with the highest worth CONTROL ROD stuck fully withdrawn (Ref. 4).

BASES

APPLICABLE SAFETY ANALYSES (continued)

The regulating rod insertion, the APSR positions, the AXIAL POWER IMBALANCE, and the QPT are monitored and controlled during power operation to ensure that the power distribution is within the bounds set by the safety analyses. The axial power distribution is maintained primarily by the AXIAL POWER IMBALANCE and the APSR position limits; and the radial power distribution is maintained primarily by the QPT limits. insertion The regulating rod insertion limits affect both the radial and axial power distributions. 2

The dependence of the core power distribution on burnup, regulating rod insertion, APSR position, and spatial xenon distribution is taken into account when the reload safety evaluation analysis is performed.

Operation at the AXIAL POWER IMBALANCE limit must be interpreted as operating the core at the maximum allowable $F_Q(Z)$ or $F^N_{\Delta H}$ peaking factors assumed as initial conditions for the accident analyses with the allowed QPT present. 4

AXIAL POWER IMBALANCE satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The power distribution LCO limits have been established based on correlations between power peaking and easily measured process variables: regulating rod position, APSR position, AXIAL POWER IMBALANCE, and QPT. The AXIAL POWER IMBALANCE envelope limits contained in the COLR represents the setpoints for which the core power distribution would either exceed the LOCA LHR limits or cause a reduction in the DNBR below the Safety Limit during the loss of flow accident with the allowable QPT present and with the APSR positions consistent with the limitations on APSR withdrawal determined by the fuel cycle design and specified by LCO 3.2.2. 4

~~Operation beyond the power distribution based LCO limits for the corresponding ALLOWABLE THERMAL POWER and simultaneous occurrence of either the LOCA or loss of forced reactor coolant flow accident has an acceptably low probability. Therefore, if the LCO limits are violated, a short time is allowed for corrective action before a significant power reduction is required.~~ 7

BASES

LCO (continued)

limits

The AXIAL POWER IMBALANCE ~~maximum allowable setpoints~~ (measurement system dependent limits) applicable for the ~~full~~ Incore Detector System ~~the Minimum Incore Detector System,~~ and the Excore Detector System are provided in the COLR. 4

~~Actual alarm setpoints implemented in the unit may be more restrictive than the maximum allowable setpoint values to provide additional conservatism between the actual alarm setpoints and the measurement system independent limit.~~ 7

APPLICABILITY

In MODE 1, the limits on AXIAL POWER IMBALANCE must be maintained when THERMAL POWER is > 40% RTP to prevent the core power distribution from exceeding the LOCA and loss of flow assumptions used in the accident analyses. Applicability of these limits at < 40% RTP in MODE 1 is not required. This operation is acceptable because the combination of AXIAL POWER IMBALANCE with the maximum allowable THERMAL POWER level will not result in LHRs sufficiently large to violate the fuel design limits. In MODES 2, 3, 4, 5, and 6, this LCO is not applicable because the reactor is not generating sufficient THERMAL POWER to produce fuel damage.

In MODE 1, it may be necessary to suspend the AXIAL POWER IMBALANCE limits during PHYSICS TESTS per LCO 3.1.8, "PHYSICS TESTS Exceptions - MODE 1." Suspension of these limits is permissible because the reactor protection criteria are maintained by the remaining LCOs governing the three dimensional power distribution and by the Surveillances required by LCO 3.1.8.

ACTIONS

A.1

The AXIAL POWER IMBALANCE operating limits that maintain the validity of the assumptions regarding the power distributions in the accident analyses of the LOCA and the loss of flow accident are provided in the COLR. Operation within the AXIAL POWER IMBALANCE limits given in the COLR is the acceptable region of operation. Operation in violation of the AXIAL POWER IMBALANCE limits given in the COLR is the restricted region of operation.

Operation with AXIAL POWER IMBALANCE in the restricted region shown on the AXIAL POWER IMBALANCE figures in the COLR potentially violates the LOCA LHR limits ($F_Q\cancel{(Z)}$ limits) or the loss of flow accident DNB peaking limits $F^N_{\Delta H}$ limits) or both. For verification that 4

BASES

ACTIONS (continued)

$F_Q(Z)$ and $F^N_{\Delta H}$ are within their specified limits, SR 3.2.5.1 is performed using the Incore Detector System to obtain a three dimensional power distribution map. Verification that $F_Q(Z)$ and $F^N_{\Delta H}$ are within their specified limits ensures that operation with the AXIAL POWER IMBALANCE in the restricted region does not violate the ECCS or 95/95 DNB criteria. The required Completion Time of 2 hours provides reasonable time for the operator to obtain a power distribution map and to determine and verify that the power peaking factors are within their specified limits. The 2 hour Frequency provides reasonable time to ensure that continued verification of the power peaking factors is obtained as core conditions (primarily regulating rod insertion and induced xenon redistribution) change, because little rod motion occurs in 2 hours due to fuel burnup, the potential for xenon redistribution is limited, and the probability of an event occurring in this short time frame is low. 4 4

A.2

Indefinite operation with the AXIAL POWER IMBALANCE in the restricted region is not prudent. Even if power peaking monitoring per Required Action A.1 is continued, excessive AXIAL POWER IMBALANCE over an extended period of time may cause a potentially adverse xenon redistribution to occur. Therefore, power peaking monitoring is only allowed for a maximum of 24 hours. This required Completion Time is reasonable based on the low probability of a limiting event occurring simultaneously with the AXIAL POWER IMBALANCE outside the limits of this LCO. In addition, this limited Completion Time precludes long term depletion of the reactor fuel with excessive AXIAL POWER IMBALANCE and gives the operator sufficient time to reposition the APSRs or regulating rods to reduce the AXIAL POWER IMBALANCE because adverse effects of xenon redistribution and fuel depletion are limited.

B.1

any

is not

If ~~the~~ Required Action~~s~~ and ~~the~~ associated Completion Time~~s of~~ ~~Condition A cannot be~~ met, the AXIAL POWER IMBALANCE may exceed its specified limits and the reactor may be operating with a global axial power distribution mismatch. Continued operation in this configuration may induce an axial xenon oscillation and may result in an increased linear heat generation rate when the xenon redistributes. Reducing 3

BASES

ACTIONS (continued)

THERMAL POWER to ≤ 40% RTP reduces the maximum LHR to a value that does not exceed the $F_Q(Z)$ and $F^N_{\Delta H}$ initial condition limits assumed in the accident analyses. The required Completion Time of 2 hours is reasonable based on limiting a potentially adverse xenon redistribution, the low probability of an accident occurring in this relatively short time period, and the number of steps required to complete this Action. 4

SURVEILLANCE REQUIREMENTS

The AXIAL POWER IMBALANCE can be monitored by both the Incore and Excore Detector Systems. The AXIAL POWER IMBALANCE maximum allowable setpoints limits are derived from their corresponding measurement system independent limits by adjusting for both the system observability errors and instrumentation errors. Although they may be based on the same measurement system independent limits, the setpoints for the different systems are not identical because of differences in the errors applicable for each of these systems. The uncertainty analysis that defines the required error adjustment to convert the measurement system independent limits to alarm setpoints maximum allowable limits assumes that 75% of the incore detectors in each quadrant are OPERABLE. ~~Detectors located on the core major axes are assumed to contribute one half of their output to each quadrant; detectors in the center assembly are assumed to contribute one quarter of their output to each quadrant. For AXIAL POWER IMBALANCE measurements using the Incore Detector System, the Minimum Incore Detector System consists of OPERABLE detectors configured as follows:~~

~~a. Nine detectors shall be arranged such that there are three detectors in each of three strings and there are three detectors lying in the same axial plane, with one plane at the core midplane and one plane in each axial core half,~~

~~b. The axial planes in each core half shall be symmetrical about the core midplane, and~~

~~c. The detector strings shall not have radial symmetry.~~

~~Figure B 3.2.3-1 (Minimum Incore Detector System for AXIAL POWER IMBALANCE Measurement) depicts an example of this configuration. This arrangement is chosen to reduce the uncertainty in the measurement of the AXIAL POWER IMBALANCE by the Minimum Incore Detector System. For example, the requirement for placing one detector of each of the three strings at the core midplane puts three detectors in~~ 4

BASES

SURVEILLANCE REQUIREMENTS (continued)

~~the central region of the core where the neutron flux tends to be higher. It also helps prevent measuring an AXIAL POWER IMBALANCE that is excessively large when the reactor is operating at low THERMAL POWER levels. The third requirement for placement of detectors (i.e., radial asymmetry) reduces uncertainty by measuring the neutron flux at core locations that are not radially symmetric.~~ 4

SR 3.2.3.1

Verification of the AXIAL POWER IMBALANCE indication every 12 hours ensures that the AXIAL POWER IMBALANCE limits are not violated and takes into account other information ~~and alarms~~ available to the operator in the control room. This Surveillance Frequency is acceptable because the mechanisms that can cause AXIAL POWER IMBALANCE, such as xenon redistribution or CONTROL ROD drive mechanism malfunctions that cause slow AXIAL POWER IMBALANCE increases, can be discovered by the operator before the specified limits are violated. 4

REFERENCES

1. 10 CFR 50.46.
2. U FSAR, ~~Chapter [15]~~ Section 6.3. 4 5
3. UFSAR, Section 15.4.3.
4. UFSAR, Appendix 3D.1.23, Criterion 27 – Combined Reactivity Control Systems Capability. 4

This figure for illustration only.
Do not use for operation.

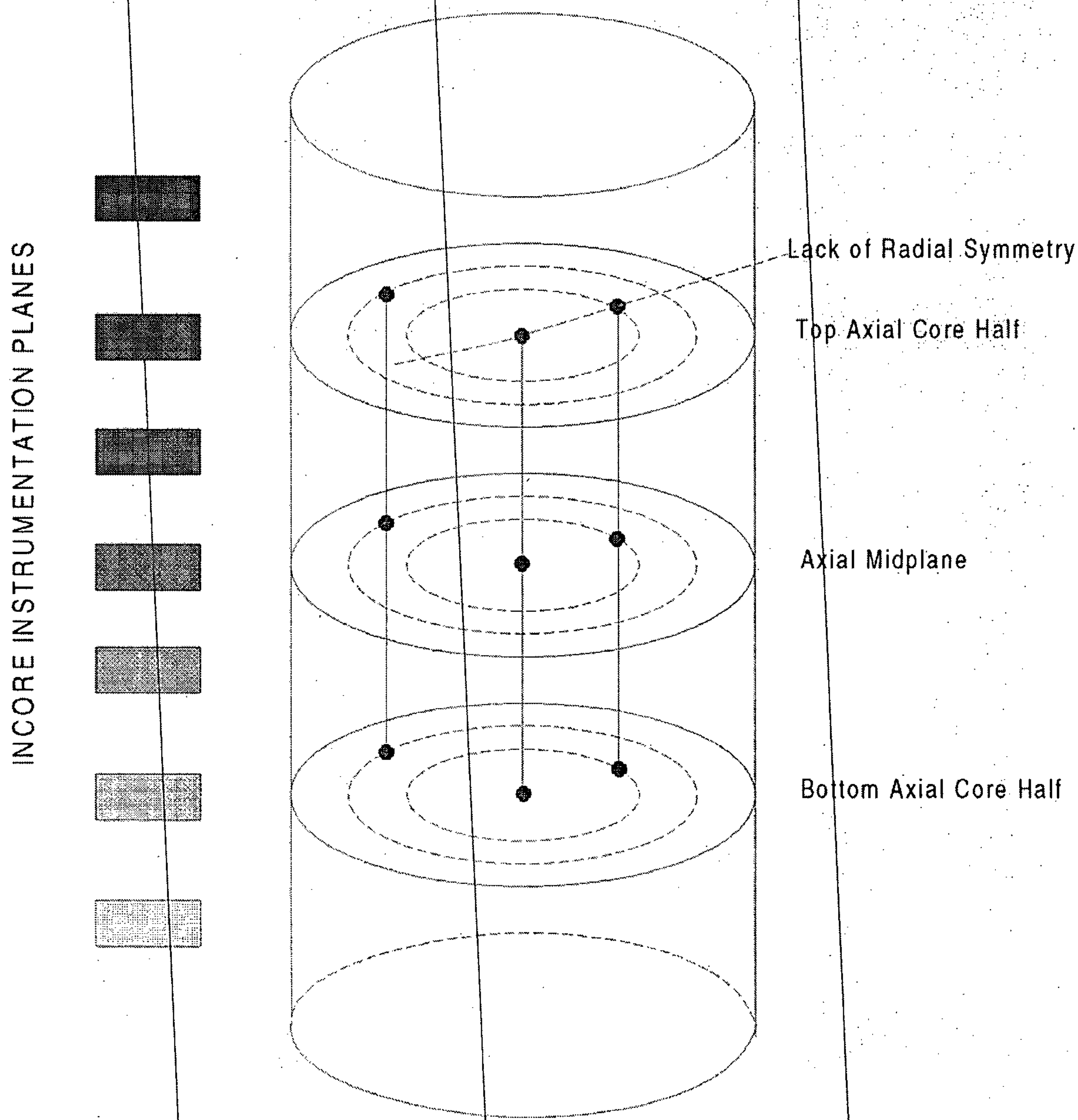

Figure B 3.2.3-1 (page 1 of 1)
Minimum Incore System for AXIAL POWER IMBALANCE Measurement

4

JUSTIFICATION FOR DEVIATIONS
ITS 3.2.3 BASES, AXIAL POWER IMBALANCE OPERATING LIMITS

1. These punctuation corrections have been made consistent with the Writer's Guide for the Improved Standard Technical Specifications, TSTF-GG-05-01, Section 5.1.3.

2. Changes are made to reflect other places in the Bases.

3. Changes are made to reflect changes made to the Specification.

4. Changes are made (additions, deletions, and/or changes) to the ISTS Bases which reflect the plant specific nomenclature, number, reference, system description, analysis, or licensing basis description.

5. The brackets have been removed and the proper plant specific information/value has been provided.

6. Changes are made to be consistent with other places in the Bases (i.e., LCO 3.2.5 Bases Background).

7. The ISTS LCO 3.2.3 Bases includes a discussion of "Actual Alarm Setpoints" for AXIAL POWER IMBALANCE operating limits. This discussion is not included in the ITS LCO 3.2.3 Bases. The "Actual Alarm Setpoints" are not needed to satisfy the requirements of the LCO and therefore a discussion of the "Actual Alarm Setpoints" is not needed in the LCO Bases.

Specific No Significant Hazards Considerations (NSHCs)

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATIONS
ITS 3.2.3, AXIAL POWER IMBALANCE OPERATING LIMITS

There are no specific NSHC discussions for this Specification.

ATTACHMENT 4

ITS 3.2.4, QUADRANT POWER TILT (QPT)

Current Technical Specification (CTS) Markup and Discussion of Changes (DOCs)

ITS 3.2.4

ITS

A01

POWER DISTRIBUTION LIMITS

QUADRANT POWER TILT

LIMITING CONDITION FOR OPERATION

LCO 3.2.4 — 3.2.4 THE QUADRANT POWER TILT shall not exceed the Steady State Limit for QUADRANT POWER TILT provided in the CORE OPERATING LIMITS REPORT. L01

APPLICABILITY: MODE 1 above ~~15~~ 20% of RATED THERMAL POWER ~~*~~. A02

ACTION:

ACTION A

a. With the QUADRANT POWER TILT determined to exceed the Steady State Limit but less than or equal to the Transient Limit provided in the CORE OPERATING LIMITS REPORT:

Add proposed Required Action A.1.1 — L02

1. Within 2 hours:

~~a) Either reduce the QUADRANT POWER TILT to within its Steady State Limit, or~~ A03

b) Reduce THERMAL POWER so as not to exceed THERMAL POWER, including power level cutoff, allowable for the reactor coolant pump combination less at least 2% for each 1% of QUADRANT POWER TILT in excess of the Steady State Limit and within ~~4~~ 10 hours, reduce the High Flux Trip Setpoint and the Flux-Δ Flux-Flow Trip Setpoint at least 2% for each 1% of QUADRANT POWER TILT in excess of the Steady State Limit. L02

ACTION C

2. Verify that the QUADRANT POWER TILT is within its Steady State Limit within 24 hours after exceeding the Steady State Limit or reduce THERMAL POWER to less than 60% of THERMAL POWER allowable for the reactor coolant pump combination within the next 2 hours and reduce the High Flux Trip Setpoint to ≤ 65.5% of THERMAL POWER allowable for the reactor coolant pump combination within the ~~next 4~~ 10 hours. L03

SR 3.2.4.1

3. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 60% of THERMAL POWER allowable for the reactor coolant pump combination may proceed provided that the QUADRANT POWER TILT is verified within its Steady State Limit at least once per hour for 12 hours or until verified acceptable at 95% or greater RATED THERMAL POWER.

Add proposed ACTION D — M01

~~*See Special Test Exception 3.10.1.~~ A02

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ITS 3.2.4

ITS

A01

POWER DISTRIBUTION LIMITS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

ACTION B — b. With the QUADRANT POWER TILT determined to exceed the Transient Limit but less than the Maximum Limit provided in the CORE OPERATING LIMITS REPORT, due to misalignment of either a safety, regulating or axial power shaping rod:

1. Reduce THERMAL POWER at least 2% for each 1% of indicated QUADRANT POWER TILT in excess of the Steady State Limit within 30 minutes.

2. Verify that the QUADRANT POWER TILT is within its Transient Limit within 2 hours after exceeding the Transient Limit or reduce THERMAL POWER to less than 60% of THERMAL POWER allowable for the reactor coolant pump combination within the next 2 hours and reduce the High Flux Trip Setpoint to ≤ 65.5% of THERMAL POWER allowable for the reactor coolant pump combination within the next 4 hours. — ACTION C

10 — L03

SR 3.2.4.1 — 3. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 60% of THERMAL POWER allowable for the reactor coolant pump combination may proceed provided that the QUADRANT POWER TILT is verified within its Steady State Limit at least once per hour for 12 hours or until verified acceptable at 95% or greater RATED THERMAL POWER

ACTION C — c. With the QUADRANT POWER TILT determined to exceed the Transient Limit but less than the Maximum Limit provided in the CORE OPERATING LIMITS REPORT, due to causes other than the misalignment of either a safety, regulating or axial power shaping rod:

1. Reduce THERMAL POWER to less than 60% of THERMAL POWER allowable for the reactor coolant pump combination within 2 hours and reduce the High Flux Trip Setpoint to ≤ 65.5% of THERMAL POWER allowable for the reactor coolant pump combination within the next 4 hours.

10 — L03

SR 3.2.4.1 — 2. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER; subsequent POWER OPERATION above 60% of THERMAL POWER allowable for the reactor coolant pump combination may proceed provided that the QUADRANT POWER TILT is verified within its Steady State Limit at least once per hour for 12 hours or until verified at 95% or greater RATED THERMAL POWER.

Add proposed ACTION D — M01

ITS 3.2.4

ITS

A01

POWER DISTRIBUTION LIMITS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

ACTION D

d. With the QUADRANT POWER TILT determined to exceed the Maximum Limit provided in the CORE OPERATING LIMITS REPORT, reduce THERMAL POWER to ≤ 15% of RATED THERMAL POWER within 2 hours.

20

L01

SURVEILLANCE REQUIREMENTS

SR 3.2.4.1

4.2.4 The QUADRANT POWER TILT shall be determined to be ≤ the Steady State Limits provided in the CORE OPERATING LIMITS REPORT at least once every 7 days during operation above 15% of RATED THERMAL POWER ~~except when the QUADRANT POWER TILT alarm is inoperable, then the QUADRANT POWER TILT shall be calculated at least once per 12 hours.~~

20

L01

L04

DISCUSSION OF CHANGES
ITS 3.2.4, QUADRANT POWER TILT (QPT)

ADMINISTRATIVE CHANGES

A01 In the conversion of the Davis-Besse Current Technical Specifications (CTS) to the plant specific Improved Technical Specifications (ITS), certain changes (wording preferences, editorial changes, reformatting, revised numbering, etc.) are made to obtain consistency with NUREG-1430, Rev. 3.1, "Standard Technical Specifications-Babcock and Wilcox Plants" (ISTS).

These changes are designated as administrative changes and are acceptable because they do not result in technical changes to the CTS.

A02 The Applicability of CTS 3.2.4 is modified by footnote * stating "See Special Test Exception 3.10.1." ITS 3.2.4 Applicability does not contain the footnote or a reference to the Special Test Exception.

The purpose of the CTS 3.2.4 footnote * reference is to alert the user that a Special Test Exception exists which may modify the Applicability of the Specification. It is an ITS convention to not include these types of footnotes or cross-references. This change is designated as an administrative change since it does not result in technical changes to the CTS.

A03 CTS 3.2.4 Action a.1.a states that with QPT determined to exceed the Steady State Limit but less than or equal to the Transient Limit within 2 hours to reduce the QPT to within its Steady State Limit. ITS 3.2.4 does not contain a Required Action stating QPT must be reduced to within its limit.

This change is acceptable because the technical requirements have not changed. Restoration of compliance with the LCO is always an available Required Action and it is the convention in the ITS to not state such "restore" options explicitly unless it is the only action or is required for clarity. This change is designated as an administrative change since it does not result in technical changes to the CTS.

MORE RESTRICTIVE CHANGES

M01 CTS 3.2.4 Action a.2, Action b.2, and Action c.1 do not provide any default actions to exit the Applicability of the Specification if any of the Required Actions are not met. If those actions are not complete, CTS 3.0.3 would be entered requiring entry into Hot Standby (MODE 3) within 7 hours. However, since the Applicability of CTS 3.2.3 is MODE 1 with THERMAL POWER > 15% RTP, the power reduction would only be to 15% RTP. ITS 3.2.4 ACTION D requires a THERMAL POWER reduction to $\leq$ 20% RTP within 2 hours. This changes the CTS by requiring THERMAL POWER to be reduced to outside of the Applicability of the Specification from 7 hours to 2 hours. The change from 15% RTP to 20% RTP is discussed in DOC L01.

The purpose of requiring a reduction of THERMAL POWER is to place the plant in a condition where the requirements for QPT limits are not required. This change is acceptable because it provides an adequate period of time to correct the condition or be in a MODE in which the requirement does not apply. The

DISCUSSION OF CHANGES
ITS 3.2.4, QUADRANT POWER TILT (QPT)

Completion Time of 2 hours is reasonable for reaching < 20 % RTP from full power in an orderly manner and without challenging unit systems. This change has been designated as more restrictive because it reduces the Completion Time to be outside of the Applicability of the Specification.

RELOCATED SPECIFICATIONS

None

REMOVED DETAIL CHANGES

None

LESS RESTRICTIVE CHANGES

L01 *(Category 2 – Relaxation of Applicability)* CTS 3.2.4 is applicable in MODE 1 above 15% RTP. In addition, due to this Applicability, when the QPT is exceeding the Maximum Limit in the COLR, CTS 3.2.4 Action d requires a power reduction to ≤ 15% RTP. Furthermore, CTS 4.2.4, the QPT Surveillance, is required when above 15% RTP. ITS 3.2.4 is applicable in MODE 1 when > 20% RTP. Under similar conditions as in the CTS, ITS 3.2.4 ACTION D requires a reduction in power to ≤ 20% RTP. Furthermore, ITS SR 3.2.4.1 is applicable when > 20% RTP. This changes the CTS by changing the Applicability of the QPT requirement from > 15% RTP to >20% RTP.

The purpose of the QPT limits is to assist in preventing the core power distribution from exceeding the design limits. This change is acceptable because the proposed 20% RTP Applicability limit will continue to ensure the core power distribution will not exceed the design limits. At power levels at or below 20% RTP, tilt limitations are unnecessary. Since tilt is a measure of the increase in quadrant radial power relative to average quadrant power, large tilts can result from small deviations in core quadrant powers when the reactor is operating at low power. Requiring tilt monitoring at 20% RTP provides a conservatively low power limit for Applicability. Operation below 20% RTP with a QPT up to 20% is acceptable because the resulting maximum linear heat rate (LHR) is not high enough to cause violation of the loss of coolant LHR limit (F_Q limit) or the initial condition departure from nucleate boiling allowable peaking factor ($F^N_{\Delta H}$ limit) during accidents initiated from this power level. Furthermore, the proposed power level of 20% RTP is large enough to obtain more meaningful QPT indications using the Incore Detector System without compromising safety. This change is designated as less restrictive because the ITS LCO requirements are applicable in fewer operating conditions than in the CTS.

L02 *(Category 3 – Relaxation of Completion Time)* CTS 3.2.4 Action a.1.b, which applies when QPT is determined to exceed the Steady State Limit but less than or equal to the Transient Limit, requires a reduction of THERMAL POWER within 2 hours and also requires a reduction of the High Flux trip setpoint and the Flux-

DISCUSSION OF CHANGES
ITS 3.2.4, QUADRANT POWER TILT (QPT)

ΔFlux-Flow trip setpoint at least 2% for each 1% of QPT in excess of the Steady State Limit within 4 hours. CTS 3.2.4 Action a.2 requires QPT to be within it Steady State limit within 24 hours. Under the same conditions in the ITS, ITS 3.2.4 ACTION A requires the reduction in THERMAL POWER and the trip setpoints but the Completion Time for reducing the trip setpoints has been extended to 10 hours or provides the option to perform ITS SR 3.2.5.1 (Verify F_Q and $F^N_{\Delta H}$ are within limits by using the Incore Detector System to obtain a power distribution map) once per 2 hours, and requires restoration of QPT to within limits within 24 hours. This changes the CTS by extending the Completion Time to reduce the trip setpoints from "4 hours" to "10 hours" and providing an option to verify F_Q and $F^N_{\Delta H}$ are within their limits once per 2 hours for the first 24 hours instead of reducing THERMAL POWER and the trip setpoints.

The purpose of CTS 3.2.4 Action a.1.b is provide appropriate compensatory measures for QPT greater than that the Steady State Limit but less than or equal to the Transient Limit. This change is acceptable because the Completion Time is consistent with safe operation under the specified Condition, considering the OPERABLE status of the redundant systems or features. This includes a reasonable time for repairs or replacement, and the low probability of a DBA occurring during the allowed Completion Time. This changes the CTS by extending the Completion Time to reduce the trip setpoints and provides an option to verify F_Q and $F^N_{\Delta H}$ are within their limits once per 2 hours instead of reducing THERMAL POWER and the trip setpoint. The steady state limit specified in the COLR provides an allowance for QPT that may occur during normal operation. A peaking increase to accommodate QPTs up to the steady state limit is allowed by the regulating rod insertion limits of LCO 3.2.1 and the AXIAL POWER IMBALANCE limits of LCO 3.2.3. Operation with QPT greater than the steady state limit specified in the COLR potentially violates the LOCA LHR limits (F_Q limits), or loss of flow accident DNB peaking limits ($F^N_{\Delta H}$ limits), or both. Verification that F_Q and $F^N_{\Delta H}$ are within their limits ensures that operation with QPT greater than the steady state limit does not violate the ECCS or 95/95 DNB criteria. The required Completion Time of once per 2 hours is a reasonable amount of time to allow the operator to obtain a power distribution map and to verify the power peaking factors. Repeating SR 3.2.5.1 every 2 hours is a reasonable Frequency at which to ensure that continued verification of the power peaking factors is obtained as core conditions that influence QPT change. The safety analysis has shown that a conservative corrective action is to reduce THERMAL POWER by 2% RTP or more from the ALLOWABLE THERMAL POWER for each 1% of QPT in excess of the steady state limit. This action limits the local LHR to a value corresponding to steady state operation, thereby reducing it to a value within the assumed accident initial condition limits. The required Completion Time of 2 hours is reasonable, based on limiting the potential for xenon redistribution, the low probability of an accident occurring, and the steps required to complete the Required Action. If QPT can be reduced to less than or equal to the steady state limit in < 2 hours, the reactor may return to normal operation without undergoing a power reduction. Significant radial xenon redistribution does not occur within this amount of time. The required Completion Time of 2 hours after the last performance of SR 3.2.5.1 allows reduction of THERMAL POWER in the event the operators cannot or choose not to continue

DISCUSSION OF CHANGES
ITS 3.2.4, QUADRANT POWER TILT (QPT)

to perform SR 3.2.5.1 as required by Required Action A.1.1. Power operation is allowed to continue if THERMAL POWER is reduced in accordance with Required Action A.1.2.1. The same reduction (i.e., 2% RTP or more) is also applicable to the High Flux trip setpoint and the Flux-ΔFlux-Flow trip setpoint, for each 1% of QPT in excess of the steady state limit. This reduction maintains both core protection and an OPERABILITY margin at the reduced THERMAL POWER level similar to that at RTP. The required Completion Time of 10 hours is reasonable based on the need to limit the potentially adverse xenon redistribution, the low probability of an accident occurring while operating out of specification, and the number of steps required to complete the Required Action. Although the actions directed by Required Action A.1.2.1 restore margins, if the source of the QPT is not established and corrected, it is prudent to establish increased margins. A required Completion Time of 24 hours to reduce QPT to less than the steady state limit is a reasonable time for investigation and corrective measures. This change is designated as less restrictive because additional time is allowed to reduce the trip setpoints and an option has been provided to verify F_Q and $F^N_{\Delta H}$ are within their limits once per 2 hours.

L03 *(Category 3 – Relaxation of Completion Time)* CTS 3.2.4 Action a.1 and a.2 provide Actions for when QPT is determined to exceed the Steady State Limit but less than or equal to the Transient Limit. CTS 3.2.4 Action b.1 and b.2 provide Actions for when QPT is determined to exceed the Transient Limit but less than or equal to the Maximum Limit. CTS 3.2.4 Action b.1 and b.2 provide Actions for when QPT is determined to exceed the Transient Limit but less than or equal to the Maximum Limit due to misalignment of either a safety, regulating or axial power shaping rod. When these Actions are not met CTS 3.2.4 Action a.2 and CTS 3.2.4 Action b.2 both require a reduction to less than 60% of the ALLOWABLE THERMAL POWER within 2 hours and a reduction in the High Flux trip setpint to < 65.5% within 4 hours. CTS 3.2.4 Action c.1 provide Actions for when QPT is determined to exceed the Transient Limit but less than the Maximum Limit due to causes other than the misalignment of either a safety, regulating or axial power shaping rod. Under the same conditions, ITS 3.2.4 ACTION C specifies the same requirements however the Completion Time to reduce the High Flux trip setpoint has been extended to 10 hours. This changes the CTS by extending the Completion Time from "4 hours" to "10 hours."

The purpose of CTS 3.2.4 Actions is to provide appropriate compensatory measures for QPT greater than the specified limits. This change is acceptable because the Completion Time is consistent with safe operation under the specified Condition, considering a reasonable time for restoration and the low probability of a DBA occurring during the allowed Completion Time. This changes the CTS by extending the Completion Time to reduce the trip setpoints of the High Flux channels. Under the specified conditions a power reduction to < 60% RTP provides conservative protection from increased peaking due to xenon redistribution. The required Completion Time of 2 hours is reasonable to allow the operator to reduce THERMAL POWER to < 60% of ALLOWABLE THERMAL POWER without challenging plant systems. Reduction of the High Flux trip setpoint to ≤ 65.5% of ALLOWABLE THERMAL POWER after THERMAL POWER has been reduced to < 60% of ALLOWABLE THERMAL POWER maintains both core protection and OPERABILITY margin at reduced

DISCUSSION OF CHANGES
ITS 3.2.4, QUADRANT POWER TILT (QPT)

power similar to that at full power. The required Completion Time of 10 hours allows the operator sufficient time to reset the trip setpoint and is reasonable based on the number of steps required to complete the action. This change is designated as less restrictive because additional time is allowed to reduce the trip setpoints.

L04 *(Category 7 – Relaxation Of Surveillance Frequency - Non-24 MonthType Change)* CTS 4.2.4 requires the QPT to be verified to be within limit every 7 days when the QPT alarm is OPERABLE and requires the verification every 12 hours when the QPT alarm is inoperable. ITS SR 3.2.4.1 requires verification that QPT is within limit every 7 days. This changes the CTS by eliminating the requirement to verify QPT more frequently when the QPT alarm is inoperable.

The purpose of CTS 4.2.4 is to periodically verify that QPT is within limit. This change is acceptable because increasing the frequency of QPT verification when the QPT alarm is inoperable is unnecessary. The inoperability of the alarm does not increase the probability that QPT is outside its limit. The routine 7 day Frequency (ITS SR 3.2.4.1) continues to ensure QPT is within the limit. Furthermore, the QPT alarm is for indication only. Its use is not credited in any of the safety analyses. Thus, any response determined necessary by plant personnel due to an inoperable alarm is more appropriately controlled by plant procedures, not Technical Specifications. This change is designated as less restrictive because Surveillances will be performed less frequently under the ITS than under the CTS.

Improved Standard Technical Specifications (ISTS) Markup and Justification for Deviations (JFDs)

CTS

3.2 POWER DISTRIBUTION LIMITS

3.2.4 QUADRANT POWER TILT (QPT)

3.2.4 LCO 3.2.4 QPT shall be maintained less than or equal to the steady state limits specified in the COLR.

APPLICABILITY: MODE 1 with THERMAL POWER > [20]% RTP. 1

ACTIONS

CTS	CONDITION	REQUIRED ACTION	COMPLETION TIME	
3.2.4 Action a.1	A. QPT greater than the steady state limit and less than or equal to the transient limit.	A.1.1 Perform SR 3.2.5.1. OR A.1.2.1 Reduce THERMAL POWER ≥ 2% RTP from the ALLOWABLE THERMAL POWER for each 1% of QPT greater than the steady state limit. AND A.1.2.2 Reduce ~~nuclear overpower~~ High Flux trip setpoint and ~~nuclear overpower based on Reactor Coolant System flow and AXIAL POWER IMBALANCE~~ Flux-ΔFlux-Flow trip setpoint ≥ 2% RTP from the ALLOWABLE THERMAL POWER for each 1% of QPT greater than the steady state limit. AND	Once per 2 hours 2 hours OR 2 hours after last performance of SR ~~3.5.2.1~~ 3.2.5.1 10 hours	2 5 5 6

CTS

ACTIONS (continued)

CTS	CONDITION		REQUIRED ACTION		COMPLETION TIME
3.2.4 Action a.2			A.2	Restore QPT to less than or equal to the steady state limit.	24 hours from discovery of failure to meet the LCO
3.2.4 Action b.1, 3.2.4 Action b.2	B.	QPT greater than the transient limit and less than or equal to the maximum limit due to misalignment of a CONTROL ROD or an APSR.	B.1	Reduce THERMAL POWER ≥ 2% RTP from ALLOWABLE THERMAL POWER for each 1% of QPT greater than the steady state limit.	30 minutes
			<u>AND</u>		
			B.2	Restore QPT to less than or equal to the transient limit.	2 hours
3.2.4 Action a.2, 3.2.4 Action b.2	C.	Required Action and associated Completion Time of Condition A or B not met.	C.1	Reduce THERMAL POWER to < 60% of the ALLOWABLE THERMAL POWER.	2 hours
		<u>OR</u>	<u>AND</u>		
			C.2	Reduce ~~nuclear overpower~~ High Flux trip setpoint to ≤ 65.5% of the ALLOWABLE THERMAL POWER.	10 hours 3 5
3.2.4 Action c.1	~~D.~~	QPT greater than the transient limit and less than or equal to the maximum limit due to causes other than the misalignment of either CONTROL ROD or APSR.	~~D.1~~	~~Reduce THERMAL POWER to < 60% of the ALLOWABLE THERMAL POWER.~~	~~2 hours~~ 3
			~~<u>AND</u>~~		
			~~D.2~~	~~Reduce nuclear overpower trip setpoint to ≤ 65.5% of the ALLOWABLE THERMAL POWER.~~	~~10 hours~~

QPT
3.2.4

CTS

ACTIONS (continued)

CTS	CONDITION	REQUIRED ACTION	COMPLETION TIME
DOC M01	E. Required Action and associated Completion Time for Condition C or D not met.	E.1 Reduce THERMAL POWER to ≤ [20]% RTP.	2 hours
3.2.4 Action d	OR F. QPT greater than the maximum limit.	~~F.1 Reduce THERMAL POWER to ≤ [20]% RTP.~~	2 hours

D

D

3 1 3 3

SURVEILLANCE REQUIREMENTS

CTS	SURVEILLANCE		FREQUENCY
4.2.4, 3.2.4 Action a.3, 3.2.4 Action b.3	SR 3.2.4.1	Verify QPT is within limits as specified in the COLR.	7 days AND When QPT has been restored to less than or equal to the steady state limit, ~~1 hour for 12 consecutive hours~~, or until verified acceptable at ≥ 95% RTP

--------------------Note--------------------
Only required to be performed if both Condition C was entered and THERMAL POWER is ≥ 60% of ALLOWABLE THERMAL POWER

once every hour for 12 hours

4 2

JUSTIFICATION FOR DEVIATIONS
ITS 3.2.4, QUADRANT POWER TILT (QPT)

1. The brackets have been removed and the proper plant specific information/value has been provided.

2. Editorial changes made with no change in intent.

3. The Required Actions and associated Completion Times in ISTS 3.2.4 ACTION C and ACTION D are equivalent. Therefore, the Condition of ISTS 3.2.4 ACTION D has been merged with the Condition of ISTS 3.2.4 ACTION C. The Required Actions and associated Completion Times in ISTS 3.2.4 ACTION E and ACTION F are equivalent. Therefore, the Condition of ISTS 3.2.4 ACTION E (ITS 3.2.4 ACTION D) has been merged with the Condition of ISTS 3.2.4 ACTION F. This change is consistent with the Writer's Guide for Plant-Specific Improved Technical Specifications, TSTF-GG-05-01, Section 4.1.6. Subsequent Conditions and Required Actions have been renumbered, as applicable.

4. A Note has been added to the second Frequency of ISTS SR 3.2.4.1. The Note states that "Only required to be performed if both Condition C was entered and THERMAL POWER is 60% of ALLOWABLE THERMAL POWER. This allowance is consistent with CTS 3.2.4 Action a.3 and CTS 3.2.4 Action b.3 and the description of the SR in the Bases.

5. Changes are made which reflect the plant specific nomenclature.

6. ISTS 3.2.4 Required Action A.1.2.2 has been changed to require a reduction in the High Flux trip setpoint and Flux-ΔFlux-Flow trip setpoint of greater than or equal to 2% for each 1% of QPT in excess of the Steady State Limit. This change is consistent with the current licensing basis, consistent with the Bases wording for Required Action A.1.2.2, and consistent with similar Required Actions in ITS 3.2.5. Additionally, without this change, Operators must know that they have to reduce power even further after completing Required Action A.1.2.1. Otherwise, when they comply with Required Action A.1.2.2, they will end up lowering the trip setpoints to the same power level stipulated by Required Action A.1.2.1 and cause a reactor trip.

Improved Standard Technical Specifications (ISTS) Bases Markup and Justification for Deviations (JFDs)

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.4 QUADRANT POWER TILT (QPT)

BASES

BACKGROUND

This LCO is required to limit the core power distribution based on accident initial condition criteria.

The power density at any point in the core must be limited to maintain specified acceptable fuel design limits, including limits that preserve the criteria specified in 10 CFR 50.46 (Ref. 1). Together, LCO 3.2.1, "Regulating Rod Insertion Limits," LCO 3.2.2, "AXIAL POWER SHAPING ROD (APSR) Insertion Limits," LCO 3.2.3, "AXIAL POWER IMBALANCE Operating Limits," and LCO 3.2.4, "QUADRANT POWER TILT (QPT)," provide limits on control component operation and on monitored process variables to ensure that the core operates within the $F_Q\boxed{(Z)}$ and $F^N_{\Delta H}$ limits given in the COLR. Operation within the $F_Q\boxed{(Z)}$ limits given in the COLR prevents power peaks that exceed the loss of coolant accident (LOCA) limits derived by Emergency Core Cooling Systems (ECCS) analysis. Operation within the $F^N_{\Delta H}$ limits given in the COLR prevents departure from nucleate boiling (DNB) during a loss of forced reactor coolant flow accident. 2 8

linear heat rate (LHR)

This LCO is required to limit fuel cladding failures that breach the primary fission product barrier and release fission products to the reactor coolant in the event of a LOCA, loss of forced reactor coolant flow, or other accident requiring termination by a Reactor Protection System trip function. This LCO limits the amount of damage to the fuel cladding during an accident by maintaining the validity of the assumptions used in the safety analysis related to the initial power distribution and reactivity.

Fuel cladding failure during a postulated LOCA is limited by restricting the maximum linear heat rate (LHR) so that the peak cladding temperature does not exceed 2200°F (Ref. 2). Peak cladding temperatures > 2200°F cause severe cladding failure by oxidation due to a Zircaloy water reaction. Other criteria must also be met (e.g., maximum cladding oxidation, maximum hydrogen generation, coolable geometry, and long term cooling). However, peak cladding temperature is usually most limiting.

BASES

BACKGROUND (continued)

Proximity to the DNB condition is expressed by the departure from nucleate boiling ratio (DNBR), defined as the ratio of the cladding surface heat flux required to cause DNB to the actual cladding surface heat flux. The minimum DNBR value during both normal operation and anticipated transients is limited to the DNBR correlation limit for the particular fuel design in use, and is accepted as an appropriate margin to DNB. The DNBR correlation limit ensures that there is at least 95% probability at the 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience DNB.

The measurement system independent limits on QPT are determined directly by the reload safety evaluation analysis without adjustment for measurement system error and uncertainty. Operation beyond these limits could invalidate core power distribution assumptions used in the accident analysis. The error adjusted maximum allowable ~~alarm setpoints~~ limits (measurement system dependent limits) for QPT are specified in the COLR. 2

APPLICABLE SAFETY ANALYSES

The fuel cladding must not sustain damage as a result of normal operation (Condition 1) and anticipated operational occurrences (Condition 2). The LCOs based on power distribution (LCO 3.2.1, LCO 3.2.2, LCO 3.2.3, and LCO 3.2.4) preclude core power distributions that violate the following fuel design criteria: 2

a. During a ~~large break~~ LOCA, the peak cladding temperature must not exceed 2200°F (Ref. ~~3~~ 2); 1 2

b. During a loss of forced reactor coolant flow accident, there must be at least 95% probability at the 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience a DNB condition; 10

INSERT 1

QPT is one of the process variables that characterize and control the three dimensional power distribution of the reactor core.

Fuel cladding damage does not occur when the core is operated outside this LCO during normal operation. However, fuel cladding damage could result if an accident occurs with simultaneous violation of one or more of the LCOs governing the core power distribution. Changes in the power distribution can cause increased power peaking and correspondingly increased local LHRs.

10 **INSERT 1**

c. During an ejected rod accident, the fission energy input to the fuel must not exceed 280 cal/gm (Ref. 3); and

d. The CONTROL RODS must be capable of shutting down the reactor with a minimum required SDM with the highest worth CONTROL ROD stuck fully withdrawn (Ref. 4).

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BASES

APPLICABLE SAFETY ANALYSES (continued)

The dependence of the core power distribution on burnup, regulating rod insertion, APSR position, and spatial xenon distribution is taken into account during the reload safety evaluation analysis. An allowance for QPT is accommodated in the analysis and resultant LCO limits. The increase in peaking taken for QPT is developed from a database of full core power distribution calculations (Ref. 4). The calculations consist of simulations of many power distributions with tilt causing mechanisms (e.g., dropped or misaligned CONTROL RODS, broken APSR fingers fully inserted, misloaded assemblies, and burnup gradients). An increase of < 2% peak power per 1% QPT is supported by the analysis, therefore a value of 2% peak power increase per 1% QPT is used to bound peak power increases due to QPT. 5 2

Operation at the AXIAL POWER IMBALANCE or rod insertion limits must be interpreted as operating the core at the maximum allowable $F_Q(Z)$ or $F^N_{\Delta H}$ peaking factors for accident initial conditions with the allowed QPT present. 2

QPT satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The power distribution LCO limits have been established based on correlations between power peaking and easily measured process variables: regulating rod position, APSR position, AXIAL POWER IMBALANCE, and QPT. The regulating rod insertion limits and the AXIAL POWER IMBALANCE boundaries contained in the COLR represent the measurement system independent limits at which the core power distribution either exceeds the LOCA LHR limits or causes a reduction in DNBR below the safety limit during a loss of flow accident with the allowable QPT present and with an APSR position consistent with the limitations on APSR withdrawal determined by the fuel cycle design and specified by LCO 3.2.2.

~~Operation beyond the power distribution based LCO limits for the corresponding allowable THERMAL POWER and simultaneous occurrence of one of a LOCA, loss of forced reactor coolant flow accident, or ejected rod accident has an acceptably low probability. Therefore, if these LCO limits are violated, a short time is allowed for corrective action before a significant power reduction is required.~~ 3

BASES

LCO (continued)

The ~~maximum allowable setpoints for~~ steady state, transient, and maximum limits for QPT applicable for the ~~full symmetrical~~ Incore Detector System~~, Minimum Incore Detector System, and Excore Detector System~~ are provided~~; the setpoints are given~~ in the COLR. The ~~setpoints~~ for the ~~three systems~~ are derived by adjustment of the measurement system independent QPT limits ~~given in the COLR~~ to allow for system observability and instrumentation errors.

limits

Incore Detector System

2

~~Actual alarm setpoints implemented in the plant may be more restrictive than the maximum allowable setpoint values to allow for additional conservatism between the actual alarm setpoint and the measurement system independent limit.~~

7

~~It is desirable for an operator to retain the ability to operate the reactor when a QPT exists. In certain instances, operation of the reactor with a QPT may be helpful or necessary to discover the cause of the QPT. The combination of power level restriction with QPT in each Required Action statement restricts the local LHR to a safe level, allowing movement through the specified applicability conditions in the exception to Specification 3.0.3.~~

3

APPLICABILITY

In MODE 1, the limits on QPT must be maintained when THERMAL POWER is > 20% RTP to prevent the core power distribution from exceeding the design limits. The minimum power level of 20% RTP is large enough to obtain meaningful QPT indications without compromising safety. Operation at or below 20% RTP with QPT up to 20% is acceptable because the resulting maximum LHR is not high enough to cause violation of the LOCA LHR limit ($F_Q\boxed{(Z)}$ limit) or the initial condition DNB allowable peaking limit ($F^N_{\Delta H}$ limit) during accidents initiated from this power level. 2

In MODE 2, the combination of QPT with maximum ALLOWABLE THERMAL POWER level does not result in LHRs sufficiently large to violate the fuel design limits, and therefore, applicability in this MODE is not required. Although not specifically addressed in the LCO, QPTs > 20% in MODE 1 with THERMAL POWER < 20% RTP are allowed for the same reason.

BASES

APPLICABILITY (continued)

In MODES 3, 4, 5, and 6, this LCO is not applicable, because the reactor is not generating THERMAL POWER and QPT is indeterminate.

In MODE 1, it may be necessary to suspend the QPT limits during PHYSICS TESTS per LCO 3.1.8, "PHYSICS TESTS Exceptions - MODE 1." Suspension of these limits is permissible because the reactor protection criteria are maintained by the remaining LCOs governing the three dimensional power distribution and by the Surveillances required by LCO 3.1.8.

ACTIONS

A.1.1

The steady state limit specified in the COLR provides an allowance for QPT that may occur during normal operation. A peaking increase to accommodate QPTs up to the steady state limit is allowed by the regulating rod insertion limits of LCO 3.2.1 and the AXIAL POWER IMBALANCE limits of LCO 3.2.3.

Operation with QPT greater than the steady state limit specified in the COLR potentially violates the LOCA LHR limits ($F_Q\boxed{(Z)}$ limits), or loss of flow accident DNB peaking limits ($F^N_{\Delta H}$ limits), or both. For verification that $F_Q\boxed{(Z)}$ and $F^N_{\Delta H}$ are within their specified limits, SR ~~3.1.5.2~~ 3.2.5.1 is performed using the Incore Detector System to obtain a three dimensional power distribution map. Verification that $F_Q\boxed{(Z)}$ and $F^N_{\Delta H}$ are within their limits ensures that operation with QPT greater than the steady state limit does not violate the ECCS or 95/95 DNB criteria. The required Completion Time of once per 2 hours is a reasonable amount of time to allow the operator to obtain a power distribution map and to verify the power peaking factors. Repeating SR 3.2.5.1 every 2 hours is a reasonable Frequency at which to ensure that continued verification of the power peaking factors is obtained as core conditions that influence QPT change. 2 2 4 2

A.1.2.1

The safety analysis has shown that a conservative corrective action is to reduce THERMAL POWER by 2% RTP or more from the ALLOWABLE THERMAL POWER for each 1% of QPT in excess of the steady state limit. This action limits the local LHR to a value corresponding to steady state operation, thereby reducing it to a value within the assumed

BASES

ACTIONS (continued)

accident initial condition limits. The required Completion Time of 2 hours is reasonable, based on limiting the potential for xenon redistribution, the low probability of an accident occurring, and the steps required to complete the Required Action.

If QPT can be reduced to less than or equal to the steady state limit in < 2 hours, the reactor may return to normal operation without undergoing a power reduction. Significant radial xenon redistribution does not occur within this amount of time.

3.2.5.1 The required Completion Time of 2 hours after the last performance of SR ~~3.5.2.1~~ allows reduction of THERMAL POWER in the event the operators cannot or choose not to continue to perform SR ~~3.5.2.1~~ as required by Required Action A.1.1. 5

3.2.5.1

A.1.2.2

Power operation is allowed to continue if THERMAL POWER is reduced in accordance with Required Action A.1.2.1. The same reduction (i.e., 2% RTP or more) is also applicable to the ~~nuclear overpower~~ High Flux trip setpoint and the ~~nuclear overpower based on Reactor Coolant System (RCS) flow and AXIAL POWER IMBALANCE~~ Flux-ΔFlux-Flow trip setpoint, for each 1% of QPT in excess of the steady state limit. This reduction maintains both core protection and an OPERABILITY margin at the reduced THERMAL POWER level similar to that at RTP. The required Completion Time of 10 hours is reasonable based on the need to limit the potentially adverse xenon redistribution, the low probability of an accident occurring while operating out of specification, and the number of steps required to complete the Required Action. 5

A.2

Although the actions directed by Required Action A.1.2.1 restore margins, if the source of the QPT is not established and corrected, it is prudent to establish increased margins. A required Completion Time of 24 hours from discovery of failure to meet the LCO to reduce QPT to less than the steady state limit is a reasonable time for investigation and corrective measures. 4

BASES

ACTIONS (continued)

B.1

If QPT exceeds the transient limit but is equal to or less than the maximum limit due to a misaligned CONTROL ROD or APSR, then power operation is allowed to continue if the THERMAL POWER is reduced 2% RTP or more from the ALLOWABLE THERMAL POWER for each 1% of QPT in excess of the steady state limit. Thus, the transient limit is the upper bound within which the 2% for 1% power reduction rule may be applied, but only for QPTs caused by CONTROL ROD or APSR misalignment. The required Completion Time of 30 minutes ensures that the operator completes the THERMAL POWER reduction before significant xenon redistribution occurs. maximum 4

B.2

When a misaligned CONTROL ROD or APSR occurs, a local xenon redistribution may occur. The required Completion Time of 2 hours allows the operator sufficient time to relatch or realign a CONTROL ROD or APSR, but is short enough to limit xenon redistribution so that large increases in the local LHR do not occur due to xenon redistribution resulting from the QPT.

or if QPT is greater than the transient limit and less than or equal to the maximum limit due to misalignment of a CONTROL ROD or an APSR

C.1

any

is

If the Required Action and associated Completion Time of Condition A or B are not met, a further power reduction is required. Power reduction to < 60% RTP provides conservative protection from increased peaking due to xenon redistribution. The required Completion Time of 2 hours is reasonable to allow the operator to reduce THERMAL POWER to < 60% of ALLOWABLE THERMAL POWER without challenging plant systems. 5

Power reduction to 60% of the ALLOWABLE THERMAL POWER is a conservative method of limiting the maximum core LHR for QPTs up to the maximum limit. Although the power reduction is based on the correlation used in Required Actions A.1.2.1 and B.1, the database for a power peaking increase as a function of QPT is less extensive for tilt mechanisms other than misaligned CONTROL RODS and APSRs. Because greater uncertainty in the potential power peaking increase exists with the less extensive database, a more conservative action is taken when the tilt is caused by a mechanism other than a misaligned CONTROL ROD or APSR.

C.2

High Flux

Reduction of the ~~nuclear overpower~~ trip setpoint to ≤ 65.5% of ALLOWABLE THERMAL POWER after THERMAL POWER has been reduced to < 60% of ALLOWABLE THERMAL POWER maintains both core protection and OPERABILITY margin at reduced power similar to that at full power. The required Completion Time of 10 hours allows the operator sufficient time to reset the trip setpoint and is reasonable based on ~~operating experience~~. 5

the number of steps required to complete the Required Action 9

BASES

ACTIONS (continued)

D.1

Power reduction to 60% of the ALLOWABLE THERMAL POWER is a conservative method of limiting the maximum core LHR for QPTs up to 20%. Although the power reduction is based on the correlation used in Required Actions A.1.2.1 and B.1, the database for a power peaking increase as a function of QPT is less extensive for tilt mechanisms other than misaligned CONTROL RODS and APSRs. Because greater uncertainty in the potential power peaking increase exists with the less extensive database, a more conservative action is taken when the tilt is caused by a mechanism other than a misaligned CONTROL ROD or APSR. The required Completion Time of 2 hours allows the operator to reduce THERMAL POWER to ≤ 60% of the ALLOWABLE THERMAL POWER without challenging plant systems. 5

D.2

Reduction of the nuclear overpower trip setpoint to ≤ 65.5% of the ALLOWABLE THERMAL POWER after THERMAL POWER has been reduced to < 60% of the ALLOWABLE THERMAL POWER maintains both core protection and an operating margin at reduced power similar to that at full power. The required Completion Time of 10 hours allows the operator sufficient time to reset the trip setpoint and is reasonable based on operating experience. 5

D

any

E.1

and associated Completion Time of

is not

or if QPT is greater than the maximum limit

If the Required Actions for Condition C or D cannot be met within the required Completion Time, then the reactor will continue in power operation with significant QPT. Either the power level has not been reduced to comply with the Required Action or the nuclear overpower trip setpoint has not been reduced within the required Completion Time. To preclude risk of fuel damage in any of these conditions, THERMAL POWER is reduced further. Specification 3.0.3 normally requires a shutdown to MODE 3. However, operation at 20% RTP allows the operator to investigate the cause of the QPT and to correct it. Local LHRs with a large QPT do not violate the fuel design limits at or below 20% RTP. The required Completion Time of 2 hours is acceptable based on limiting the potential increase in local LHRs that could occur due to xenon redistribution with the QPT out of specification. 5

the reactor must be brought to a MODE or other specified condition in which the LCO does not apply. To achieve this status, THERMAL POWER must be reduced to < 20% RTP within 2 hours.

The maximum limit specified in the COLR is set as the upper bound within which power reduction to 60% of ALLOWABLE THERMAL POWER or power reduction of 2% from ALLOWABLE THERMAL POWER for each 1% of QPT (for misaligned CONTROL RODS only) applies (Ref. 5). The maximum limit specified in the COLR is consistent with allowing power operation up to 60% of ALLOWABLE THERMAL POWER when QPT setpoints are exceeded. QPT in excess of the maximum limit can be an indication of a severe power distribution anomaly, and a power reduction to at most 20% RTP ensures local LHRs do not exceed allowable limits while the cause is being determined and corrected.

BASES

ACTIONS (continued)

F.1

The maximum limit of 20% QPT is set as the upper bound within which power reduction to 60% of ALLOWABLE THERMAL POWER or power reduction of 2% for 1% (for misaligned CONTROL RODS only) applies (Ref. 4).

The maximum limit of 20% QPT is consistent with allowing power operation up to 60% of ALLOWABLE THERMAL POWER when QPT setpoints are exceeded. QPT in excess of the maximum limit can be an indication of a severe power distribution anomaly, and a power reduction to at most 20% RTP ensures local LHRs do not exceed allowable limits while the cause is being determined and corrected. 5

The required Completion Time of 2 hours is reasonable to allow the operator to reduce THERMAL POWER to ≤ 20% RTP without challenging plant systems.

SURVEILLANCE REQUIREMENTS

QPT can be monitored by both the incore and excore detector systems. The QPT setpoints are derived from their corresponding measurement system independent limits by adjustment for system observability errors and instrumentation errors. Although they may be based on the same measurement system independent limit, the setpoints for the different systems are not identical because of differences in the errors applicable for these systems. For QPT measurements using the Incore Detector System, the Minimum Incore Detector System consists of OPERABLE detectors configured as follows:

limits

Incore Detector System

consists of 75% of the detectors per quadrant.

a. Two sets of four detectors shall lie in each core half. Each set of detectors shall lie in the same axial plane. The two sets in the same core half may lie in the same axial plane.

b. Detectors in the same plane shall have quarter core radial symmetry.

Figure B 3.2.4-2 (Minimum Incore Detector System for QPT Measurement) depicts an example of this configuration. The symmetric incore system for QPT uses the Incore Detector System as described above and is configured such that at least 75% of the detectors in each core quadrant are OPERABLE. 2

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.2.4.1

Checking the QPT indication every 7 days ensures that the operator can determine whether the plant computer software and Incore Detector System inputs for monitoring QPT are functioning properly and takes into account other information ~~and alarms~~ available to the operator in the control room. This procedure allows the QPT mechanisms, such as xenon redistribution, burnup gradients, and CONTROL ROD drive mechanism malfunctions, which can cause slow development of a QPT, to be detected. Operating experience has confirmed the acceptability of a Surveillance Frequency of 7 days. 2

Following restoration of the QPT to within the steady state limit, operation at ≥ 95% RTP may proceed provided the QPT is determined to remain within the steady state limit at the increased THERMAL POWER level. In case QPT exceeds the steady state limit for more than 24 hours or exceeds the transient limit (Condition A, ~~B~~ or ~~D~~), the potential for xenon redistribution is greater. Therefore, the QPT is monitored ~~for 12 consecutive hourly intervals~~ to determine whether the period of any oscillation due to xenon redistribution causes the QPT to exceed the steady state limit again. 5 5

B

once every hour for 12 hours

REFERENCES

1. 10 CFR 50.46.
2. U FSAR, Section [ ] 6.3. 2 6
3. ~~ANSI N18.2-1973, American National Standards Institute, August 6, 1973.~~ 2
5 ~~4~~. BAW 10122A, Rev. 1, May 1984. 2

3. UFSAR, Section 15.4.3.
4. UFSAR, Appendix 3D.1.23, Criterion 27 – Combined Reactivity Control Systems Capability. 2

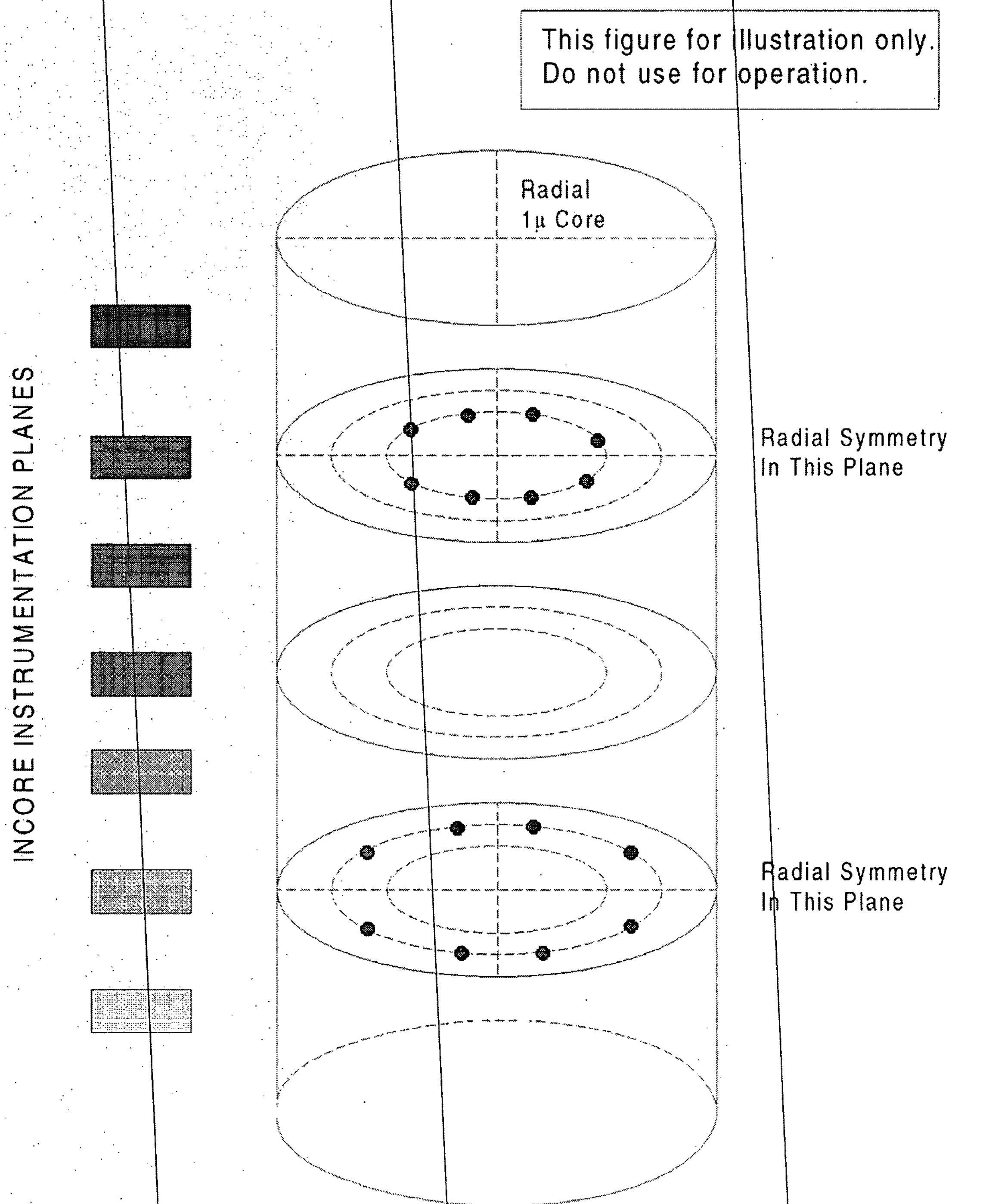

Figure B 3.2.4-1 (page 1 of 1)
Minimum Incore System for QUADRANT POWER TILT Measurement

2

JUSTIFICATION FOR DEVIATIONS
ITS 3.2.4 BASES, QUADRANT POWER TILT (QPT)

1. These punctuation corrections have been made consistent with the Writer's Guide for the Improved Standard Technical Specifications, TSTF-GG-05-01, Section 5.1.3.

2. Changes are made (additions, deletions, and/or changes) to the ISTS Bases which reflect the plant specific nomenclature, number, reference, system description, analysis, or licensing basis description.

3. The ISTS 3.2.4 Bases, LCO section provides a discussion that it is sometimes desirable to continue to operate the reactor when the QPT limit is not met, and describes why this is acceptable. This discussion has not been maintained in the Davis-Besse ITS Bases. The discussion is basically describing what is allowed for all LCO statements – that the LCO can be not met under certain circumstances as long as the associated ACTIONS are followed. The ISTS ACTIONS Bases provides the details concerning what to do if the LCO statement is not met, consistent with the format of the ISTS Bases. Furthermore, the ISTS Bases describes that the Required Actions restricts the local LHR to a safe level, "allowing movement through the specified applicability conditions in the exception to Specification 3.0.3." ISTS LCO 3.0.3 provides action to take if no actions are provided in the individual Specifications. Thus, the ACTIONS provided in ISTS 3.2.4 are not an "exception to Specification 3.0.3." Therefore, this paragraph has been deleted.

4. Changes are made to reflect the Specification.

5. Changes are made to reflect changes made to the Specification.

6. The brackets have been removed and the proper plant specific information/value has been provided.

7. The ISTS LCO 3.2.4 Bases includes a discussion of "Actual Alarm Setpoints" for QPT. This discussion is not included in the ITS LCO 3.2.4 Bases. The "Actual Alarm Setpoints" are not needed to satisfy the requirements of the LCO and therefore a discussion of the "Actual Alarm Setpoints" is not needed in the LCO Bases.

8. Changes are made to be consistent with other places in the Bases (i.e., LCO 3.2.5 Bases Background).

9. Change made to be consistent with the Bases of LCO 3.2.4 Required Action A.1.2.2.

10. Changes made to be consistent with other places in the Bases.

Specific No Significant Hazards Considerations (NSHCs)

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATIONS
ITS 3.2.4, QUADRANT POWER TILT (QPT)

There are no specific NSHC discussions for this Specification.

ATTACHMENT 5

ITS 3.2.5, POWER PEAKING FACTORS

Current Technical Specification (CTS) Markup and Discussion of Changes (DOCs)

ITS 3.2.5

A01

ITS

POWER DISTRIBUTION LIMITS

NUCLEAR HEAT FLUX HOT CHANNEL FACTOR - F_Q

LIMITING CONDITION FOR OPERATION

LCO 3.2.5 — 3.2.2 F_Q shall be within the limits specified in the CORE OPERATING LIMITS REPORT.

APPLICABILITY: MODE 1 with THERMAL POWER > 20% RTP (L01)

ACTION:

With F_Q exceeding its limit:

ACTION A — a. Reduce THERMAL POWER at least 1% for each 1% F_Q exceeds the limit within 15 minutes and similarly reduce the high flux trip setpoint and flux-Δ flux-flow trip setpoint within ~~4~~ 10 hours. (L02)

ACTION A, ACTION C — b. Demonstrate through incore mapping that F_Q is within its limit within 24 hours after exceeding the limit or reduce THERMAL POWER to less than ~~5%~~ 20 of RATED THERMAL POWER within the next 2 hours. (L01)

~~c. Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER above the reduced limit required by a or b, above; subsequent POWER OPERATION may proceed provided that F_Q is demonstrated through incore mapping to be within its limit at a nominal 50% of RATED THERMAL POWER prior to exceeding this THERMAL POWER, at a nominal 75% of RATED THERMAL POWER prior to exceeding this THERMAL POWER and within 24 hours after attaining 95% or greater RATED THERMAL POWER.~~ (L03)

SURVEILLANCE REQUIREMENTS

SR 3.2.5.1 — 4.2.2.1 F_Q shall be determined to be within its limit by using the incore detectors to obtain a power distribution map: Add proposed Note to SR 3.2.5.1 (L04)

ITS 3.2.5

A01

ITS

POWER DISTRIBUTION LIMITS

SURVEILLANCE REQUIREMENTS (Continued)

SR 3.2.5.1

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

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

~~c. The provisions of Specification 4.0.4 are not applicable.~~

As specified by the applicable LCO(s)

L04

~~4.2.2.2 The measured F_Q of 4.2.2.1 above, shall be increased by 1.4% to account for manufacturing tolerances and further increased by 7.5% to account for measurement uncertainty.~~

LA01

LA02

DAVIS-BESSE, UNIT 1 3/4 2-6

A01

ITS

POWER DISTRIBUTION LIMITS

NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR - $F^N_{\Delta H}$

LIMITING CONDITION FOR OPERATION

LCO 3.2.5 3.2.3 $F^N_{\Delta H}$ shall be within the limits specified in the CORE OPERATING LIMITS REPORT.

APPLICABILITY: MODE 1. with THERMAL POWER > 20% RTP L01

ACTION:

With $F^N_{\Delta H}$ exceeding its limit: RH(%) RTP M01

ACTION B a. Reduce THERMAL POWER at least 1% for each 1% that $F^N_{\Delta H}$ exceeds the limit within 15 minutes and similarly reduce the High Flux Trip Setpoint and Flux - ΔFlux - Flow Trip Setpoint within 4 hours. 10 L02

ACTION B b. Demonstrate through in-core mapping that $F^N_{\Delta H}$ is within its limit within 24 hours after exceeding the limit or

ACTION C reduce THERMAL POWER to less than 5% of RATED THERMAL POWER within the next 2 hours. 20 L01

c. ~~Identify and correct the cause of the out of limit condition prior to increasing THERMAL POWER above the reduced limit required by a or b above; subsequent POWER OPERATION may proceed provided that $F^N_{\Delta H}$ is demonstrated through in-core mapping to be within its limit at a nominal 50% of RATED THERMAL POWER prior to exceeding this THERMAL POWER, at a nominal 75% of RATED THERMAL POWER prior to exceeding this THERMAL POWER and within 24 hours after attaining 95% or greater RATED THERMAL POWER.~~ L03

ITS 3.2.5

ITS

A01

POWER DISTRIBUTION LIMITS

SURVEILLANCE REQUIREMENTS

Add proposed Note to SR 3.2.5.1

SR 3.2.5.1 4.2.3.1 $F^N_{\Delta H}$ shall be determined to be within its limit by using the incore detectors to obtain a power distribution map:

As specified by the applicable LCO(s)

L04

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

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

~~c. The provisions of Specification 4.0.4 are not applicable.~~

~~4.2.3.2 The measured $F^N_{\Delta H}$ of 4.2.3.1 above, shall be increased by 5% for measurement uncertainty.~~

LA01

LA02

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DISCUSSION OF CHANGES
ITS 3.2.5, POWER PEAKING FACTORS

ADMINISTRATIVE CHANGES

A01 In the conversion of the Davis-Besse Current Technical Specifications (CTS) to the plant specific Improved Technical Specifications (ITS), certain changes (wording preferences, editorial changes, reformatting, revised numbering, etc.) are made to obtain consistency with NUREG-1430, Rev. 3.1, "Standard Technical Specifications-Babcock and Wilcox Plants" (ISTS).

These changes are designated as administrative changes and are acceptable because they do not result in technical changes to the CTS.

MORE RESTRICTIVE CHANGES

M01 CTS 3.2.3 Action a requires a reduction of THERMAL POWER at least 1% for each 1% $F^N_{\Delta H}$ exceeds the limit and a similar reduction in the High Flux and Flux-ΔFlux-Flow Trip Setpoints. ITS 3.2.5 Required Actions B.1 and B.2 require a reduction of THERMAL POWER and a reduction of the High Flux and Flux-ΔFlux-Flow Trip Setpoints of $\geq$ RH (%) RTP for each 1% that $F^N_{\Delta H}$ exceeds the limit. This changes the CTS by requiring THERMAL POWER and the High Flux and Flux-ΔFlux-Flow Trip Setpoints be reduced by RH (%) RTP for each 1% that $F^N_{\Delta H}$ exceeds the limit instead of by 1% for each 1% that $F^N_{\Delta H}$ exceeds the limit.

The purpose of CTS 3.2.3 Action a is to reduce the maximum linear heat rate in the core so that protection from departure from nucleate boiling (DNB) during a limiting loss of flow transient is maintained. The proposed RH value will be specified in the COLR, and is currently 3.3%. Thus, the proposed value of THERMAL POWER and Trip Setpoint reduction is greater than the current value provided in CTS 3.2.3 Action a. The proposed value (RH) is based on an analysis of the DNB ratio during the limiting loss of forced reactor coolant flow transient from various initial THERMAL POWER levels. Therefore, the change is considered acceptable. This change is designated as more restrictive because a greater THERMAL POWER and Trip Setpoint reduction is required in the ITS than is required in the CTS.

RELOCATED SPECIFICATIONS

None

REMOVED DETAIL CHANGES

LA01 *(Type 3 – Removal of Procedural Details for Meeting TS Requirements or Reporting Requirements)* CTS 4.2.2.2 requires that the measured F_Q of CTS 4.2.2.1 to be increased by 1.4% to account for manufacturing tolerances and further increased by 7.5% to account for measurement uncertainty. CTS 4.2.3.2 requires that the measured $F^N_{\Delta H}$ of CTS 4.2.3.1 to be increased by 5% for measurement uncertainty. ITS SR 3.2.5.1 does not require these additional factors to be incorporated. This changes the CTS by relocating the

DISCUSSION OF CHANGES
ITS 3.2.5, POWER PEAKING FACTORS

procedural detail to include manufacturing tolerances and measurement uncertainty, as appropriate, in the measurement of F_Q and $F^N_{\Delta H}$ to the Bases. The relocation of the specific values of the manufacturing tolerances and measurement uncertainties corrections are justified in Discussion of Change LA02.

The purpose of CTS 4.2.2.2 and CTS 4.2.3.2 is to ensure that values of F_Q and $F^N_{\Delta H}$ determined through incore mapping conservatively include allowances for manufacturing tolerances and measurement uncertainty, as appropriate. The removal of these details for performing Surveillance Requirements from the Technical Specifications is acceptable because this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The ITS still retains requirements to perform appropriate verifications of F_Q and $F^N_{\Delta H}$. Also, this change is acceptable because these types of procedural details will be adequately controlled in the ITS Bases. Changes to the Bases are controlled by the Technical Specifications Bases Control Program in Chapter 5. This program provides for the evaluation of changes to ensure the Bases are properly controlled. This change is designated as a less restrictive removal of detail change because procedural details for meeting Technical Specifications requirements are being removed from the Technical Specifications.

LA02 *(Type 5 – Removal of Cycle-Specific Parameter Limits from the Technical Specifications to the Core Operating Limits Report)* CTS 4.2.2.2 requires that the measured F_Q of CTS 4.2.2.1 to be increased by 1.4% to account for manufacturing tolerances and further increased by 7.5% to account for measurement uncertainty. CTS 4.2.3.2 requires that the measured $F^N_{\Delta H}$ of CTS 4.2.3.1 to be increased by 5% for measurement uncertainty. ITS SR 3.2.5.1 does not require these additional factors to be incorporated. This changes the CTS by relocating the specific values of the manufacturing tolerances and measurement uncertainties corrections, which must be confirmed on a cycle-specific basis, to the COLR. The relocation of the procedural details to make the corrections to the measured F_Q and $F^N_{\Delta H}$ is justified in Discussion of Change LA01.

The removal of these cycle-specific parameter limits from the Technical Specifications to the COLR is acceptable because the cycle-specific limits are developed or utilized under NRC-approved methodologies which will ensure that the Safety Limits are met. The NRC documented in Generic Letter 88-16, "Removal of Cycle-Specific Parameter Limits From Technical Specifications," that this type of information is not necessary to be included in the Technical Specifications to provide adequate protection of public health and safety. The ITS still retains the requirement to verify that the absolute position indicator channels and the relative position indicator channels agree within the limit. The methodologies used to develop the parameters in the COLR have obtained prior approval by the NRC in accordance with Generic Letter 88-16. Also, this change is acceptable because the removed information will be adequately controlled in the COLR under the requirements provided in ITS 5.6.3, "CORE OPERATING LIMITS REPORT." ITS 5.6.3 ensures that the applicable limits (e.g., fuel thermal

DISCUSSION OF CHANGES
ITS 3.2.5, POWER PEAKING FACTORS

mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems limits, and nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analyses are met. This change is designated as a less restrictive removal of detail change because information relating to cycle-specific parameter limits is being removed from the Technical Specifications.

LESS RESTRICTIVE CHANGES

L01 *(Category 2 – Relaxation of Applicability)* CTS 3.2.2 and CTS 3.2.3 are both applicable in MODE 1. ITS 3.2.5 is applicable in MODE 1 with THERMAL POWER > 20% RTP. This changes the CTS by reducing the applicable MODES in which the Nuclear Heat Flux Hot Channel Factor (F_Q) and Nuclear Enthalpy Rise Hot Channel Factor ($F^N_{\Delta H}$) requirements must be met.

The purpose of CTS 3.2.2 and CTS 3.2.3 is to establish limits that constrain the core power distribution within design limits during normal operation and during anticipated operational occurrences such that accident initial condition protection criteria are preserved. This change is acceptable because the requirements continue to ensure that the core power distributions are maintained in the MODES and other specified conditions assumed in the safety analyses and licensing basis. This change revises the Applicabilities of CTS 3.2.2 and CTS 3.2.3 from "MODE 1" to "MODE 1 with THERMAL POWER > 20% RTP." With THERMAL POWER less than or equal to 20% RTP, the reactor has insufficient stored energy in the fuel or energy being transferred to the coolant to require a limit on the distribution of core power. Along with this change the THERMAL POWER of 5% RTP in the default action (CTS 3.2.2 Action b and CTS 3.2.3 Action c) have been changed to 20% RTP. This change is designated as less restrictive because the LCO requirements are applicable in fewer operating conditions than in the CTS.

L02 *(Category 3 – Relaxation of Completion Time)* CTS 3.2.2 Action a states the High Flux and Flux-ΔFlux-Flow trip setpoints must be reduced 1% for each 1% F_Q exceeds its limit within 4 hours. The CTS 3.2.3 Action a states the High Flux and Flux-ΔFlux-Flow trip setpoints must be reduced 1% for each 1% $F^N_{\Delta H}$ exceeds its limit within 4 hours. ITS 3.2.5 Required Actions A.2 and B.2 requires the trip setpoints to be reduced similarly within 10 hours. This changes the CTS by extending the Completion Time from 4 hours to 10 hours.

The purpose of CTS 3.2.2 Action a and the CTS 3.2.3 Action a is to reduce the High Flux and Flux-ΔFlux-Flow trip setpoints when F_Q or $F^N_{\Delta H}$ exceeds its limit in order to maintain both core protection and OPERABILITY margin at the reduced THERMAL POWER. This change is acceptable because the Completion Time is consistent with safe operation under the specified Condition, considering the OPERABILITY status of the redundant systems of required features, the capacity and capability of remaining features, a reasonable time for repairs or replacement of required features, and the low probability of a DBA occurring during the allowed Completion Time. The power reduction required by CTS 3.2.2 Action a, CTS 3.2.3 Action a, and ITS 3.2.5 Required Actions A.1

DISCUSSION OF CHANGES
ITS 3.2.5, POWER PEAKING FACTORS

and B.1, limit the linear heat rate in the core to within an acceptable value. The reduction of the trip setpoints is considered to be a backup that is intended to maintain an OPERABILITY margin comparable to that at RTP, and to provide core protection. The revised Completion Time of 10 hours is considered reasonable based upon the number of steps required to complete the action and the low probability of an accident occurring during the Completion Time that would require the associated trips to function. This change is designated as less restrictive because additional time is allowed to reduce the trip setpoints than was allowed in the CTS.

L03 *(Category 4 – Relaxation of Required Action)* CTS 3.2.2 Action c and CTS 3.2.3 Action c require that, in the event F_Q and $F^N_{\Delta H}$ (the power peaking factors), respectively, are not within limits, the cause of the out of limit condition be identified and corrected prior to increasing THERMAL POWER above the reduced limit required by Actions a or b. In addition, these Actions state that subsequent POWER OPERATION may proceed provided that F_Q and $F^N_{\Delta H}$, respectively, are demonstrated through in-core mapping to be within their limits at a nominal 50% of RATED THERMAL POWER (RTP) prior to exceeding this THERMAL POWER, at a nominal 75% of RTP prior to exceeding this THERMAL POWER and within 24 hours after attaining 95% or greater RTP. ITS 3.2.5 does not contain these actions. This changes the CTS by deleting the requirement to confirm the peaking factors are within limit at 50% RTP, 75% RTP, and 95% RTP.

The purpose of the CTS 3.2.2 Action c and CTS 3.2.3 Action c is to require confirmation that the core power distributions are within limits during the power increase following an out of limit condition. This change is acceptable because the Required Actions are used to establish remedial measures that must be taken in response to the degraded conditions in order to minimize risk associated with continued operation while providing time to repair inoperable features. The Required Actions are consistent with safe operation under the specified Condition, because only a short time period of 24 hours is allowed to operate with the power peaking factors outside of limits. This time period limits the potential for inducing an adverse perturbation in the axial xenon distribution. Operating the unit in accordance with the requirements of ITS LCO 3.1.4, "CONTROL ROD Group Alignment Limits," LCO 3.2.1, "Regulating Rod Insertion Limits," LCO 3.2.2, "AXIAL POWER SHAPING ROD (APSR) Insertion Limits," LCO 3.2.3, "AXIAL POWER IMBALANCE Operating Limits," and LCO 3.2.4, "QUADRANT POWER TILT," provides assurance that the power peaking factors will be maintained within limits. These LCOs provide the Required Actions for correcting the cause of those conditions that could result in power peaking factors exceeding limits. This change is designated as less restrictive because less stringent Required Actions are being applied in the ITS than were applied in the CTS.

L04 *(Category 7 – Relaxation of Surveillance Frequency - Non-24 Month Type Change)* CTS 4.2.2.1 and CTS 4.2.3.1 require, in part, that F_Q and $F^N_{\Delta H}$, respectively, are determined to be within limits by using the incore detectors to obtain a power distribution map. The Frequencies of the Surveillance Requirements are prior to operation above 75% RTP after each fuel loading, at

DISCUSSION OF CHANGES
ITS 3.2.5, POWER PEAKING FACTORS

least once per 31 Effective Full Power Days. The Surveillance Frequency also states that the provisions of Specification 4.0.4 are not applicable. ITS SR 3.2.5.1 requires that F_Q and $F^N_{\Delta H}$, be verified to be within limits by using the Incore Detector System to obtain a power distribution map as specified by the applicable LCO(s). ITS SR 3.2.5.1 is modified by a note that states that the verification is only required to be performed when specified in LCO 3.1.8, "PHYSICS TESTS Exceptions - MODE 1," or when complying with Required Actions of LCO 3.1.4, "CONTROL ROD Group Alignment Limits," LCO 3.2.1, "Regulating Rod Insertion Limits," LCO 3.2.2, "AXIAL POWER SHAPING ROD (APSR) Insertion Limits," LCO 3.2.3, "AXIAL POWER IMBALANCE Operating Limits," and LCO 3.2.4, "QUADRANT POWER TILT." This changes the CTS by deleting the requirement to perform the power peaking factor determinations at the specified Frequencies.

The purpose of CTS 4.2.2.1.b and CTS 4.2.3.1.b is to demonstrate that F_Q and $F^N_{\Delta H}$ are within the limits specified in the respective LCOs. This change is acceptable because operating the unit in accordance with the requirements of ITS LCO 3.1.4, "CONTROL ROD Group Alignment Limits," LCO 3.2.1, "Regulating Rod Insertion Limits," LCO 3.2.2, "AXIAL POWER SHAPING ROD (APSR) Insertion Limits," LCO 3.2.3, "AXIAL POWER IMBALANCE Operating Limits," and LCO 3.2.4, "QUADRANT POWER TILT," provides assurance that the power peaking factors will be maintained within limits. CTS 4.2.2.1.b and CTS 4.2.3.1.b provide a confirmation of already known conditions, assuming that the unit is being operated within the requirements of LCO 3.1.4, LCO 3.2.1, LCO 3.2.2, LCO 3.2.3, and LCO 3.2.4. However, when required to be verified because of a failure to meet one or more of the referenced LCOs, the power peaking factors will be verified to ensure the continued compliance with the core power distribution assumptions of the accident analyses. This change is designated as less restrictive because Surveillances will be performed less frequently under the ITS than under the CTS.

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Improved Standard Technical Specifications (ISTS) Markup and Justification for Deviations (JFDs)

CTS

3.2 POWER DISTRIBUTION LIMITS

3.2.5 Power Peaking Factors

3.2.2, 3.2.3 LCO 3.2.5 $F_Q(\boxed{Z})$ and $F^N_{\Delta H}$ shall be within the limits specified in the COLR. 1

APPLICABILITY: MODE 1 with THERMAL POWER > 20% RTP.

ACTIONS

CTS	CONDITION	REQUIRED ACTION	COMPLETION TIME	
3.2.2 Action a, 3.2.2 Action b	A. $F_Q(\boxed{Z})$ not within limit.	A.1 Reduce THERMAL POWER ≥ 1% RTP for each 1% that $F_Q(\boxed{Z})$ exceeds limit.	15 minutes	1 1
		AND		
		A.2 Reduce ~~nuclear overpower~~ High Flux trip setpoint and ~~nuclear overpower based on Reactor Coolant System (RCS) flow and AXIAL POWER IMBALANCE~~ Flux-ΔFlux-Flow trip setpoint ≥ 1% RTP for each 1% that $F_Q(\boxed{Z})$ exceeds limit.	~~8~~ 10 hours	2 1 1 1
		AND		
		A.3 Restore $F_Q(\boxed{Z})$ to within limit.	24 hours	1
3.2.3 Action a, 3.2.3 Action b	B. $F^N_{\Delta H}$ not within limit.	B.1 Reduce THERMAL POWER ≥ RH(%) RTP (specified in the COLR) for each 1% that $F^N_{\Delta H}$ exceeds limit. AND	15 minutes	

CTS

ACTIONS (continued)

	CONDITION	REQUIRED ACTION	COMPLETION TIME	
		B.2 Reduce ~~nuclear overpower~~ High Flux trip setpoint and ~~nuclear overpower based on RCS flow and AXIAL POWER IMBALANCE~~ Flux-ΔFlux-Flow trip setpoint ≥ RH(%) RTP (specified in the COLR) for each 1% that $F^N_{\Delta H}$ exceeds limit. AND B.3 Restore $F^N_{\Delta H}$ to within limit.	~~8~~ 10 hours 24 hours	2 1 1
3.2.2 Action b, 3.2.3 Action b	C. Required Action and associated Completion Time not met.	C.1 ~~Be in MODE 1 with~~ Reduce THERMAL POWER ≤ 20% RTP.	2 hours	3

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE		FREQUENCY	
4.2.2.1, 4.2.3.1	SR 3.2.5.1	-----------------------------NOTE----------------------------- Only required to be performed when specified in LCO 3.1.8, "PHYSICS TESTS Exceptions - MODE 1," or when complying with Required Actions of LCO 3.1.4, "CONTROL ROD Group Alignment Limits," LCO 3.2.1, "Regulating Rod Insertion Limits," LCO 3.2.2, "AXIAL POWER SHAPING ROD (APSR) Insertion Limits," LCO 3.2.3, "AXIAL POWER IMBALANCE Operating Limits," or LCO 3.2.4, "QUADRANT POWER TILT (QPT)." --- Verify F_Q~~(Z)~~ and $F^N_{\Delta H}$ are within limits by using the Incore Detector System to obtain a power distribution map.	As specified by the applicable LCO(s)	4 1

JUSTIFICATION FOR DEVIATIONS
ITS 3.2.5, POWER PEAKING FACTORS

1. Changes are made which reflect the plant specific nomenclature.

2. The Completion Times of ITS Required Action A.2 and B.2 have been changed from 8 hours to 10 hours. The proposed Completion Times are consistent with the Completion Times for similar actions in ISTS 3.2.4 Required Actions A.1.2.2 and C.2 and in ISTS 3.2.4 Required Action A.2.3.

3. Editorial change made to be consistent with other Specifications (i.e., ITS 3.2.3).

4. Typographical/grammatical error corrected.

Improved Standard Technical Specifications (ISTS) Bases Markup and Justification for Deviations (JFDs)

B 3.2 POWER DISTRIBUTION LIMITS

B 3.2.5 Power Peaking Factors

BASES

BACKGROUND

The purpose of this LCO is to establish limits that constrain the core power distribution within design limits during normal operation (Condition 1) and during anticipated operational occurrences (Condition 2) such that accident initial condition protection criteria are preserved. The accident initial condition criteria are preserved by bounding operation at THERMAL POWER within specified acceptable fuel design limits.

$F_Q(\boxed{Z})$ is a specified acceptable fuel design limit that preserves the initial 2
conditions for the Emergency Core Cooling Systems (ECCS) analysis.
$F_Q(\boxed{Z})$ is defined as the maximum local fuel rod linear power density 2
divided by the average fuel rod linear power density, assuming nominal
fuel pellet and rod dimensions. Because $F_Q(\boxed{Z})$ is a ratio of local power 2
densities, it is related to the maximum local (pellet) power density in a fuel
rod. Operation within the $F_Q(\boxed{Z})$ limits given in the COLR prevents power 2
peaking that would exceed the loss of coolant accident (LOCA) linear
heat rate (LHR) limits derived from the analysis of the ECCS.

The $F^N_{\Delta H}$ limit is a specified acceptable fuel design limit that preserves the initial conditions for the limiting loss of flow transient. $F^N_{\Delta H}$ is defined as the ratio of the integral of linear power along the fuel rod on which the minimum departure from nucleate boiling ratio (DNBR) occurs to the average integrated rod power. Because $F^N_{\Delta H}$ is a ratio of integrated powers, it is related to the maximum total power produced in a fuel rod. Operation within the $F^N_{\Delta H}$ limits given in the COLR prevents departure from nucleate boiling (DNB) during a postulated loss of forced reactor coolant flow accident.

Measurement of the core power peaking factors using the Incore Detector
System to obtain a three dimensional power distribution map provides
direct confirmation that $F_Q(\boxed{Z})$ and $F^N_{\Delta H}$ are within their limits, and may be 2
used to verify that the power peaking factors remain bounded when one
or more normal operating parameters exceed their limits.

BASES

APPLICABLE SAFETY ANALYSES

The limits on $F_Q(Z)$ are determined by the ECCS analysis in order to limit peak cladding temperatures to 2200°F during a LOCA. The maximum acceptable cladding temperature is specified by 10 CFR 50.46 (Ref. 1). Higher cladding temperatures could cause severe cladding failure by oxidation due to a Zircaloy water reaction. Other criteria must also be met (e.g., maximum cladding oxidation, maximum hydrogen generation, coolable geometry, and long term cooling). However, peak cladding temperature is usually most limiting. 2

The limits on $F^N_{\Delta H}$ provide protection from DNB during a limiting loss of flow transient. Proximity to the DNB condition is expressed by the DNBR, defined as the ratio of the cladding surface heat flux required to cause DNB to the actual cladding surface heat flux. The minimum DNBR value during both normal operation and anticipated transients is limited to the DNBR correlation limit for the particular fuel design in use, and is accepted as an appropriate margin to DNB. The DNBR correlation limit ensures that there is at least 95% probability at the 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience DNB.

This LCO precludes core power distributions that violate the following fuel design criteria:

a. During a ~~large break~~ LOCA, peak cladding temperature must not exceed 2200°F (Ref. 1) ; and 3 1

b. During a loss of forced reactor coolant flow accident, there must be at least 95% probability at the 95% confidence level (the 95/95 DNB criterion) that the hot fuel rod in the core does not experience a DNB condition.

The reload safety evaluation analysis determines limits on global core parameters that characterize the core power distribution. The primary parameters used to monitor and control the core power distribution are the regulating rod position, the APSR position, the AXIAL POWER IMBALANCE, and the QPT. These parameters are normally used to monitor and control the core power distribution because their measurements are continuously observable. Limits are placed on these parameters to ensure that the core power peaking factors remain

BASES

APPLICABLE SAFETY ANALYSES (continued)

bounded during operation in MODE 1 with THERMAL POWER greater than 20% RTP. Nuclear design model calculational uncertainty, manufacturing tolerances (e.g., the engineering hot channel factor), effects of fuel densification and rod bow, and modeling simplifications (such as treatment of the spacer grid effects) are accommodated through use of peaking augmentation factors in the reload safety evaluation analysis.

$F_Q(\boxed{Z})$ and $F^N_{\Delta H}$ satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii). 2

LCO

This LCO for the power peaking factors $F_Q(\boxed{Z})$ and $F^N_{\Delta H}$ ensures that the core operates within the bounds assumed for the ECCS and thermal hydraulic analyses. Verification that $F_Q(\boxed{Z})$ and $F^N_{\Delta H}$ are within the limits of this LCO as specified in the COLR allows continued operation at THERMAL POWER when the Required Actions of LCO 3.1.4, "CONTROL ROD Group Alignment Limits," LCO 3.2.1, "Regulating Rod Insertion Limits," LCO 3.2.2, "AXIAL POWER SHAPING ROD Insertion Limits," LCO 3.2.3, "AXIAL POWER IMBALANCE Operating Limits," and LCO 3.2.4, "QUADRANT POWER TILT," are entered. Conservative THERMAL POWER reductions are required if the limits on $F_Q(\boxed{Z})$ and $F^N_{\Delta H}$ are exceeded. Verification that $F_Q(\boxed{Z})$ and $F^N_{\Delta H}$ are within limits is also required during MODE 1 PHYSICS TESTS per LCO 3.1.8, "PHYSICS TESTS Exceptions - MODE 1." 2 2 2

Measurement uncertainties are applied when $F_Q(\boxed{Z})$ and $F^N_{\Delta H}$ are determined using the Incore Detector System. The measurement uncertainties applied to the measured values of $F_Q(\boxed{Z})$ and $F^N_{\Delta H}$ account for uncertainties in observability and instrument string signal processing. 2 2

APPLICABILITY

In MODE 1 with THERMAL POWER greater than 20% RTP, the limits on $F_Q(\boxed{Z})$ and $F^N_{\Delta H}$ must be maintained in order to prevent the core power distribution from exceeding the limits assumed in the analyses of the LOCA and loss of flow accidents. In MODE 1 with THERMAL POWER less than or equal to 20% RTP and in MODES 2, 3, 4, 5, and 6, this LCO is not applicable because the reactor has insufficient stored energy in the fuel or energy being transferred to the coolant to require a limit on the distribution of core power. 2

BASES

APPLICABILITY (continued)

The minimum THERMAL POWER level of 20% RTP was chosen based on the ability of the Incore Detector System to satisfactorily obtain meaningful power distribution data.

ACTIONS

The operator must take care in interpreting the relationship of the power peaking factors $F_Q(Z)$ and $F^N_{\Delta H}$ to their limits. Limit values of $F_Q(Z)$ and 2
$F^N_{\Delta H}$ in the COLR may be expressed in either LHR or in peaking units. Because $F_Q(Z)$ and $F^N_{\Delta H}$ are power peaking factors, constant LHR is 2
maintained as THERMAL POWER is reduced, thereby allowing power peaking to be increased in inverse proportion to THERMAL POWER.

Therefore, the $F_Q(Z)$ and $F^N_{\Delta H}$ limits increase as THERMAL POWER decreases (assuming $F_Q(Z)$ and $F^N_{\Delta H}$ are expressed in peaking units) so 2
that a constant LHR limit is maintained.

A.1

When $F_Q(Z)$ is determined not to be within its specified limit as 2
determined by a three dimensional power distribution map, a THERMAL POWER reduction is taken to reduce the maximum LHR in the core. Design calculations have verified that a conservative THERMAL POWER reduction is 1% RTP or more for each 1% by which $F_Q(Z)$ exceeds its limit 2
(Ref. [ ]). The Completion Time of 15 minutes provides an acceptable 4
time to reduce power in an orderly manner and without allowing the plant to remain in an unacceptable condition for an extended period of time.

A.2

Power operation is allowed to continue by Required Action A.1 if THERMAL POWER is reduced by 1% RTP or more from the
High Flux
ALLOWABLE THERMAL POWER for each 1% by which $F_Q(Z)$ exceeds 2
its limit. The same reduction in nuclear overpower trip setpoint and
nuclear overpower based on the Reactor Coolant System (RCS) flow and 2
the AXIAL POWER IMBALANCE trip setpoint is required for each 1% by
Flux-ΔFlux-Flow
which $F_Q(Z)$ is in excess of its limit. These reductions maintain both core 2
protection and OPERABILITY margin at the reduced THERMAL POWER.
10
The required Completion Time of 8 hours is reasonable based on the low 2
probability of an accident occurring in this short time period and the number of steps required to complete the Required Action.

BASES

ACTIONS (continued)

A.3

Continued operation with $F_Q(Z)$ exceeding its limit is not permitted, 2
because the initial conditions assumed in the accident analyses are no
longer valid. The required Completion Time of 24 hours to restore $F_Q(Z)$ 2
within its limits at the reduced THERMAL POWER level is reasonable
based on the low probability of a limiting event occurring simultaneously
with $F_Q(Z)$ exceeding its limit. In addition, it precludes long term depletion 2
with local LHRs higher than the limiting values, and limits the potential for
inducing an adverse perturbation in the axial xenon distribution.

B.1

When $F^N_{\Delta H}$ is determined not to be within its acceptable limit as determined by a three dimensional power distribution map, a THERMAL POWER reduction is taken to reduce the maximum LHR in the core. The parameter RH by which THERMAL POWER is decreased per 1% increase in $F^N_{\Delta H}$ above the limit has been verified to be conservative by design calculations, and is defined in the COLR. The parameter RH is the inverse of the increase in $F^N_{\Delta H}$ allowed as THERMAL POWER decreases by 1% RTP, and is based on an analysis of the DNBR during the limiting loss of forced reactor coolant flow transient from various initial THERMAL POWER levels. The required Completion Time of 15 minutes is reasonable for the operator to take the actions necessary to reduce the unit power.

B.2

Flux-ΔFlux-Flow

When a decrease in THERMAL POWER is required because $F^N_{\Delta H}$ has
exceeded its limit, Required Action B.2 requires reduction of the High flux 2
trip setpoint and the nuclear/overpower based on RCS flow and AXIAL
POWER IMBALANCE trip setpoint. The amount of reduction of these trip
setpoints is governed by the same factor (RH(%) for each 1% that $F^N_{\Delta H}$
exceeds its limit) that determines the THERMAL POWER reduction. This
process maintains core protection by providing margin to the trip setpoints
at the reduced THERMAL POWER similar to that at RTP. The parameter
RH is specified in the COLR. The required Completion Time of 8 hours is 10 2
reasonable based on the low probability of an accident occurring in this
short time period and the number of steps required to complete this
Action.

BASES

ACTIONS (continued)

B.3

Continued operation with $F^N_{\Delta H}$ exceeding its limit is not permitted, because the initial conditions assumed in the accident analyses are no longer valid. The required Completion Time of 24 hours to restore $F^N_{\Delta H}$ within its limit at the reduced THERMAL POWER level is reasonable based on the low probability of a limiting event occurring simultaneously with $F^N_{\Delta H}$ exceeding its limit. In addition, this Completion Time precludes long term depletion with an unacceptably high local power and limits the potential for inducing an adverse perturbation in the radial xenon distribution.

C.1

If a THERMAL POWER reduction is not sufficient to restore $F_Q\boxed{(Z)}$ or $F^N_{\Delta H}$ within its limit (i.e., the Required Actions and associated Completion Times for Condition A or B are not met), then THERMAL POWER operation should be significantly reduced. The reactor is placed in MODE 1 with THERMAL POWER less than or equal to 20% RTP in which this LCO does not apply. The required Completion Time of 2 hours is a reasonable amount of time for the operator to reduce THERMAL POWER in an orderly manner and without challenging plant systems. 2

SURVEILLANCE REQUIREMENTS

SR 3.2.5.1

Core monitoring is performed using the Incore Detector System to obtain a three dimensional power distribution map. Maximum values of $F_Q\boxed{(Z)}$ and $F^N_{\Delta H}$ obtained from this map may then be compared with the $F_Q\boxed{(Z)}$ and limits in the COLR to verify that the limits have not been exceeded. Measurement of the core power peaking factors in this manner may be used to verify that the measured values of $F_Q\boxed{(Z)}$ and $F^N_{\Delta H}$ remain within their specified limits when one or more of the limits specified by LCO 3.1.4, LCO 3.2.1, LCO 3.2.2, LCO 3.2.3, or LCO 3.2.4 is exceeded, or when LCO 3.1.8 is applicable. If $F_Q\boxed{(Z)}$ and $F^N_{\Delta H}$ remain within their limits when one or more of these parameters exceed their limits, operation at THERMAL POWER may continue because the true initial conditions (the power peaking factors) remain within their specified limits. 2

BASES

SURVEILLANCE REQUIREMENTS (continued)

Because the limits on $F_Q(Z)$ and $F^N_{\Delta H}$ are preserved when the parameters specified by LCO 3.1.4, LCO 3.2.1, LCO 3.2.2, LCO 3.2.3, and LCO 3.2.4 are within their limits, a Note is provided in the SR to indicate that monitoring of the power peaking factors is required only when complying with the Required Actions of these LCOs and when LCO 3.1.8 is applicable. 2

Frequencies for monitoring of the power peaking factors are specified in the Action statements of the individual LCOs. These Frequencies are reasonable based on the low probability of a limiting event occurring simultaneously with either $F_Q(Z)$ or $F^N_{\Delta H}$ exceeding its limit, and they provide sufficient time for the operator to obtain a power distribution map from the Incore Detector System. Indefinite THERMAL POWER operation in a Required Action of LCO 3.1.4, LCO 3.2.1, LCO 3.2.2, LCO 3.2.3, or LCO 3.2.4 is not permitted, in order to limit the potential for exceeding both the power peaking factors assumed in the accident analyses due to operation with unanalyzed core power distributions and spatial xenon distributions beyond their analyzed ranges. 2 3

The measured values are required to be adjusted to account for manufacturing tolerances and measurement uncertainties before being compared to the acceptance criteria specified in the COLR. These adjustments are included in the COLR.

REFERENCES

1. 10 CFR 50.46.

JUSTIFICATION FOR DEVIATIONS
ITS 3.2.5 BASES, POWER PEAKING FACTORS

1. These punctuation corrections have been made consistent with the Writer's Guide for the Improved Standard Technical Specifications, TSTF-GG-05-01, Section 5.1.3.

2. Changes are made to reflect changes made to the Specification.

3. Changes are made (additions, deletions, and/or changes) to the ISTS Bases which reflect the plant specific nomenclature, number, reference, system description, analysis, or licensing basis description.

4. This parenthetical Reference has been deleted. The ISTS Bases does not provide a specific reference in the References Section, and other similar Actions Bases (A.2, B.1, and B.2) do not specify a Reference.

Specific No Significant Hazards Considerations (NSHCs)

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATIONS
ITS 3.2.5, POWER PEAKING FACTORS

There are no specific NSHC discussions for this Specification.