February 10, 2005

NRC-05-012
10 CFR 50.90

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

Kewaunee Nuclear Power Plant
Docket 50-305
License No. DPR-43

Response to NRC Request for Additional information re: License Amendment Request 203 To The Kewaunee Nuclear Power Plant Technical Specifications, "Rod Position Indication."

References: 1) Letter from NMC to NRC, "License Amendment Request 203 To The Kewaunee Nuclear Power Plant Technical Specifications, "Rod Position Indication," dated May 25, 2004

2) Letter from NMC to NRC, "Response to NRC Request for Additional information re: License Amendment Request 203 To The Kewaunee Nuclear Power Plant Technical Specifications. "Rod Position Indication," dated August 6, 2004.

3) Letter from NRC to NMC, "Kewaunee Nuclear Power Plant - Issuance Of Amendment Re: Rod Position Indication (TAC NO. MC3278)," dated September 22, 2004.

The Nuclear Management Company, LLC, (NMC) has submitted a license amendment request (LAR), number 203, to revise the Kewaunee Nuclear Power Plant (KNPP) Technical Specifications (TS), reference 1. This LAR requested changes to KNPP TS Section 3.10.f, "Inoperable Rod Position Indicator Channels," to add an allowed outage time (AOT) for the Individual Rod Position Indicator (IRPI) system of 24 hours with more than one IRPI per group inoperable.

Reference 1 also requested additional changes. The additional changes include adding the demand step counters as additional required rod position indication equipment, adding a note to allow for a soak time subsequent to substantial rod motion for the rods that exceed their position limits before invoking the TS requirements, and defining "immediately" in TS section 1.0.

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Due to problems experienced with the power supply for the IRPI system, NMC requested an expedited review of the LAR, especially for approval of the 24-hour AOT with more than one IRPI out-of-service. The NRC expedited their review and provided approval of the 24-hour AOT in September 2004, reference 3.

Subsequently the NRC staff has requested additional information to clarify parts of the submittal still under review. This letter is the NMC response to the NRC staff's request. Enclosure 1 contains the NRC staff's questions with NMC's response. The information contained in this response does not alter the conclusions reached in the significant hazards determination and environmental considerations contained in reference 1.

A copy of this submittal has been transmitted to the State of Wisconsin as required by 10 CFR 50.91(b)(1). Additionally, NMC continues to request approval of LAR 203 as described in reference 1.

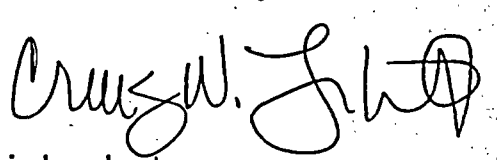
Summary of Commitments

This letter makes the following two new commitments and no revisions to previous commitments.

- NMC will include the required information concerning the soak period in plant operating procedures.
- NMC will develop an alarm on the plant process computer system (PPCS) to track the elapsed time an IRPI exceeds and produce an alarm within the 1-hour period to ensure the operators are alerted to the condition.

If you have any questions or require additional information, please contact Mr. Gerald Riste at (920) 388-8424.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on February 10, 2005.



Craig Lambert
Site Vice President, Kewaunee Nuclear Power Plant
Nuclear Management Company, LLC

Enclosures (5)

cc: Administrator, Region III, USNRC
Resident Inspector, Kewaunee, USNRC
Project Manager, Kewaunee, USNRC
Public Service Commission of Wisconsin

**ENCLOSURE 1**
**NUCLEAR MANAGEMENT COMPANY, LLC**
**RESPONSE TO NRC STAFFS' REQUEST FOR ADDITIONAL INFORMATION RE: EVALUATION OF LICENSE AMENDMENT REQUEST 203 TO KEWAUNEE NUCLEAR POWER PLANT, OPERATING LICENSE NO. DPR-43**
**DOCKET NO. 50-305**

NRC Staff Question #1

The technical analysis section for the proposed change states that the rod position will be verified every 12 hours as part of the new action statement. However, in the markup and revised pages (TS 3.10-6), it is stated that the rod position is verified by movable incore detectors every 8 hours. Please clarify which time duration is correct for performing this action.

NMC Response:

As Nuclear Management Company, LLC (NMC) stated in its response dated August 6, 2004 (Adams Accession NO. ML042300418) the rod position verification will be performed every 8 hours as stated in the technical specification. Originally, NMC thought the intent of the verification periodicity was to be performed on an operations shift basis. As the operations crew at Kewaunee Nuclear Power Plant (KNPP) is on a 12-hour shift rotation, once every 12 hours was applicable. On further review, the decision to stay with the NUREG 1431 8-hour frequency was made without changing the period in the technical analysis section. Therefore, the completion time of 8 hours, listed in the Technical Specification (TS), is the correct completion time.

NRC Staff Question #2

With one rod position indicator channel inoperable, the current Technical Specification TS 3.10.f.1.A. requires the determination of position of the rod cluster control, "...at least once per 8 hours, or subsequent to rod motion exceeding a total displacement of 24 steps, whichever occurs first." This TS implies that, following a rod displacement of greater than 24 steps, an immediate verification of rod position is required prior to the 8 hours already in effect.

The proposed TS 3.10.f.3.A would require verification within 8 hours following the same rod displacement. Please describe the safety significance of this change. Provide plant specific data that show an 8-hour completion time is acceptable for the proposed TS when a more stringent requirement was established in the original TS.

NMC Response:

Current Kewaunee Nuclear Power Plant (KNPP) Technical Specifications (TS) 3.10.f.1A states:

> *For operation between 50% and 100% of rating, the position of the rod cluster control shall be checked indirectly by core instrumentation (excore detector and/or thermocouples and/or movable incore detectors) at least once per eight hours, or subsequent to rod motion exceeding a total displacement of 24 steps, whichever occurs first.*

The purpose of the change was to align KNPP TS with Improved Standard Technical Specifications (ISTS). This KNPP TS item requires checking of the rod(s) position subsequent to rod motion exceeding a total displacement of 24 steps by core instrumentation (excore detector and/or thermocouples and/or movable incore detectors). NUREG 1431, Revision 3, states to verify the position of the rod(s) with inoperable position indicators indirectly by using movable incore detectors within [4] hours.

NMC has reviewed the activities necessary to determine rod position following a movement of the rods of ≥ 24 steps. This review determined that the verification of rod position could be accomplished within 4 hours instead of the originally proposed 8 hours.

Current practice is to commence the determination of the rods position, subsequent to a rod motion of 24 steps. Following approval of this change the practice of initiating actions to verify the rods position will continue to be commenced subsequent to a rod motion of 24 steps. The difference is that this change adds a requirement for a completion time, which the current TS do not require. Therefore, as there is no change to the initiation of actions, NMC has determined that there is no safety significance associated with this change.

NMC currently has no plant specific data showing the acceptability of an 8-hour completion time. As stated above, this change adds a completion time for the verification of the rod position, which the current TS do not have.

NRC Staff Question #3

How is NMC going to monitor the soak time to ensure the period the IRPI is misaligned is tracked and the time the soak period elapses is caught?

NMC Response:

NMC will include the required information concerning the soak period in plant operating procedures. Additionally, NMC will develop an alarm on the plant process computer system (PPCS) to track the elapsed time an IRPI exceeds and produce an alarm within the 1-hour period to ensure the operators are alerted to the condition.

NRC Staff Question #4:

TS 3.10.f.4.A does not contain any logic connector. Are the sub-items 1) and 2) connected by an "and" or an "or"?

NMC Response:

NMC has added a logic connector (and) to the requirements to provide clarity, see enclosure 2 for this change.

NRC Staff Question #5:

The staff has discussed the proposed change to add the second note to TS 3.10.f, which is currently in the ISTS Bases. Since use of the incore detectors is required in either case, putting the note in the TS is an unnecessary complication to the TS that provides no benefit. Thus, the NRC staff requires further justification for the proposed amendment.

NMC Response:

NMC agrees with the staffs' assessment and has removed the second note, see enclosure 2 for this change.

ENCLOSURE 2

NUCLEAR MANAGEMENT COMPANY, LLC
MARKED UP TECHNICAL SPECIFICATION PAGES
KEWAUNEE NUCLEAR POWER PLANT, OPERATING LICENSE NO. DPR-43
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4 pages follow

e. Rod Misalignment Limitations

NOTE: Individual RPIs may be outside their limits for < 1 hour following substantial rod movement

This specification defines allowable limits for misaligned rod cluster control assemblies. In TS 3.10.e.1 and TS 3.10.e.2, the magnitude, in steps, of an indicated rod misalignment may be determined by comparison of the respective bank demand step counter to the analog individual rod position indicator, the rod position as noted on the plant process computer, or through the conditioning module output voltage via a correlation of rod position vs. voltage. Rod misalignment limitations do not apply during physics testing.

1. When reactor power is ≥85% of rating, the rod cluster control assembly shall be maintained within ± 12 steps from their respective banks. If a rod cluster control assembly is misaligned from its bank by more than ± 12 steps when reactor power is ≥85%, then the rod will be realigned or the core power peaking factors shall be determined within four hours, and TS 3.10.b applied. If peaking factors are not determined within four hours, the reactor power shall be reduced to < 85% of rating.

2. When reactor power is < 85% but ≥ 50% of rating, the rod cluster control assemblies shall be maintained within ± 24 steps from their respective banks. If a rod cluster control assembly is misaligned from its bank by more than ± 24 steps when reactor power is < 85% but ≥ 50%, the rod will be realigned or the core power peaking factors shall be determined within four hours, and TS 3.10.b applied. If the peaking factors are not determined within four hours, the reactor power shall be reduced to < 50% of rating.

3. And, in addition to TS 3.10.e.1 and TS 3.10.e.2, if the misaligned rod cluster control assembly is not realigned within eight hours, the rod shall be declared inoperable.

f. Inoperable Rod Position Indicator Channels

NOTE: Individual RPIs may be outside their limits for < 1 hour following substantial rod movement

1. If ~~a~~one individual rod position indicator channel per group is ~~out of service~~inoperable for one or more groups, then perform either A or B below: (Note: Separate entry condition is allowed for each inoperable individual rod position indicator.)

   A. ~~For operation between 50% and 100% of rating,~~ Verify the position of the rod cluster control ~~shall be checked~~ indirectly by ~~core instrumentation (excore detector and/or thermocouples and/or~~ movable incore detectors~~)~~ ~~at least once per~~ each eight hours, or ~~subsequent to rod motion exceeding a total displacement of 24 steps, whichever occurs first.~~

   B. ~~During operation < 50% of rating, no special monitoring is required.~~ Within 8 hours reduce reactor thermal power to ≤ 50% of RATED POWER.

2. If more than one individual rod position indicator channel per group are inoperable, then:

   A. IMMEDIATELY place the control rods in manual, and

   B. Once per 1 hour, monitor and record RCS $T_{avg}$, and

   C. Verify the position of the rod by movable incore detectors each 8 hours, and

LAR 203a

D. Within 24 hours restore the inoperable individual rod position indicators to OPERABLE status such that a maximum of one IRPI per group is inoperable or place the plant in HOT SHUTDOWN within the following 6 hours.

3. If one or more rods with inoperable individual rod position indicators have been moved in excess of 24 steps in one direction since the last determination of the rods position then perform A or B below:

A. Within 4 hours verify the position of the rod by movable incore detectors, or

B. Within 8 hours reduce reactor thermal power to ≤ 50% of RATED POWER.

4. If one demand position indicator per bank for one or more banks is inoperable then perform either A or B below: (Note: Separate condition entry is allowed for each inoperable demand position indicator.)

A. Each 8 hours verify,

1) All IRPI's for the affected banks are OPERABLE, by administrative means, and

2) The most withdrawn rod and the least withdrawn rod of the affected bank(s) are ≤ 12 steps apart when > 85% RATED POWER or ≤ 24 steps when ≤ 85% RATED POWER.

B. Within 8 hours, reduce reactor thermal power to ≤ 50% of RATED POWER.

~~3.~~5. If a rod cluster control assembly having a rod position indicator channel out of service is found to be misaligned from TS 3.10.f.1.A, then TS 3.10.e will be applied.

g. Inoperable Rod Limitations

1. An inoperable rod is a rod which does not trip or which is declared inoperable under TS 3.10.e or TS 3.10.h.

2. Not more than one inoperable full length rod shall be allowed at any time.

3. If reactor operation is continued with one inoperable full length rod, the potential ejected rod worth and associated transient power distribution peaking factors shall be determined by analysis within 30 days unless the rod is made OPERABLE earlier. The analysis shall include due allowance for nonuniform fuel depletion in the neighborhood of the inoperable rod. If the analysis results in a more limiting hypothetical transient than the cases reported in the safety analysis, the plant power level shall be reduced to an analytically determined part power level which is consistent with the safety analysis.

h. Rod Drop Time

At OPERATING temperature and full flow, the drop time of each full length rod cluster control shall be no greater than 1.8 seconds from loss of stationary gripper coil voltage to dashpot entry. If drop time is > 1.8 seconds, the rod shall be declared inoperable.

i. Rod Position Deviation Monitor

If the rod position deviation monitor is inoperable, individual rod positions shall be logged at least once per eight hours after a load change > 10% of rated power or after > 24 steps of control rod motion.

j. Quadrant Power Tilt Monitor

If one or both of the quadrant power tilt monitors is inoperable, individual upper and lower excore detector calibrated outputs and the quadrant tilt shall be logged once per shift and after a load change > 10% of rated power or after > 24 steps of control rod motion. The monitors shall be set to alarm at 2% tilt ratio.

k. Core Average Temperature

During steady-state power operation, $T_{ave}$ shall be maintained within the limits specified in the COLR, except as provided by TS 3.10.n.

l. Reactor Coolant System Pressure

During steady-state power operation, Reactor Coolant System pressure shall be maintained within the limits specified in the COLR, except as provided by TS 3.10.n.

m. Reactor Coolant Flow

1. During steady-state power operation, reactor coolant total flow rate shall be ≥ 178,000 gallons per minute average and greater than or equal to the limit specified in the COLR. If reactor coolant flow rate is not within the limits as specified in the COLR, action shall be taken in accordance with TS 3.10.n.

2. Compliance with this flow requirement shall be demonstrated by verifying the reactor coolant flow during initial power escalation following each REFUELING, at or above 90% power with plant parameters as constant as practical.

n. DNBR Parameters

If, during power operation any of the conditions of TS 3.10.k, TS 3.10.l, or TS 3.10.m.1 are not met, restore the parameter in two hours or less to within limits or reduce power to < 5% of thermal rated power within an additional six hours. Following analysis, thermal power may be raised not to exceed a power level analyzed to maintain a DNBR greater than the minimum DNBR limit.

ENCLOSURE 3

NUCLEAR MANAGEMENT COMPANY, LLC
REVISED TECHNICAL SPECIFICATION PAGES
KEWAUNEE NUCLEAR POWER PLANT, OPERATING LICENSE NO. DPR-43
DOCKET NO. 50-305

**4 pages follow**

e. Rod Misalignment Limitations

NOTE: Individual RPIs may be outside their limits for ≤ 1 hour following substantial rod movement

This specification defines allowable limits for misaligned rod cluster control assemblies. In TS 3.10.e.1 and TS 3.10.e.2, the magnitude, in steps, of an indicated rod misalignment may be determined by comparison of the respective bank demand step counter to the analog individual rod position indicator, the rod position as noted on the plant process computer, or through the conditioning module output voltage via a correlation of rod position vs. voltage. Rod misalignment limitations do not apply during physics testing.

1. When reactor power is ≥85% of rating, the rod cluster control assembly shall be maintained within ± 12 steps from their respective banks. If a rod cluster control assembly is misaligned from its bank by more than ± 12 steps when reactor power is ≥85%, then the rod will be realigned or the core power peaking factors shall be determined within four hours, and TS 3.10.b applied. If peaking factors are not determined within four hours, the reactor power shall be reduced to < 85% of rating.

2. When reactor power is < 85% but ≥ 50% of rating, the rod cluster control assemblies shall be maintained within ± 24 steps from their respective banks. If a rod cluster control assembly is misaligned from its bank by more than ± 24 steps when reactor power is < 85% but ≥ 50%, the rod will be realigned or the core power peaking factors shall be determined within four hours, and TS 3.10.b applied. If the peaking factors are not determined within four hours, the reactor power shall be reduced to < 50% of rating.

3. And, in addition to TS 3.10.e.1 and TS 3.10.e.2, if the misaligned rod cluster control assembly is not realigned within eight hours, the rod shall be declared inoperable.

f. Inoperable Rod Position Indicator Channels

NOTE: Individual RPIs may be outside their limits for ≤ 1 hour following substantial rod movement

1. If one individual rod position indicator channel per group is inoperable for one or more groups, then perform either A or B below: (Note: Separate entry condition is allowed for each inoperable individual rod position indicator.)

   A. Verify the position of the rod cluster control indirectly by movable incore detectors each eight hours, or

   B. Within 8 hours reduce reactor thermal power to ≤ 50% of RATED POWER.

2. If more than one individual rod position indicator channel per group are inoperable, then:

   A. IMMEDIATELY place the control rods in manual, and

   B. Once per 1 hour, monitor and record RCS $T_{avg}$, and

   C. Verify the position of the rod by movable incore detectors each 8 hours, and

   D. Within 24 hours restore the inoperable individual rod position indicators to OPERABLE status such that a maximum of one IRPI per group is inoperable or place the plant in HOT SHUTDOWN within the following 6 hours.

3. If one or more rods with inoperable individual rod position indicators have been moved in excess of 24 steps in one direction since the last determination of the rods position then perform A or B below:

   A. Within 4 hours verify the position of the rod by movable incore detectors, or

   B. Within 8 hours reduce reactor thermal power to ≤ 50% of RATED POWER.

4. If one demand position indicator per bank for one or more banks is inoperable then perform either A or B below: (Note: Separate condition entry is allowed for each inoperable demand position indicator.)

   A. Each 8 hours verify,

      1) All IRPI's for the affected banks are OPERABLE, by administrative means, and

      2) The most withdrawn rod and the least withdrawn rod of the affected bank(s) are ≤ 12 steps apart when > 85% RATED POWER or ≤ 24 steps when ≤ 85% RATED POWER.

   B. Within 8 hours, reduce reactor thermal power to ≤ 50% of RATED POWER.

5. If a rod cluster control assembly having a rod position indicator channel out of service is found to be misaligned from TS 3.10.f.1.A, then TS 3.10.e will be applied.

g. Inoperable Rod Limitations

1. An inoperable rod is a rod which does not trip or which is declared inoperable under TS 3.10.e or TS 3.10.h.

2. Not more than one inoperable full length rod shall be allowed at any time.

3. If reactor operation is continued with one inoperable full length rod, the potential ejected rod worth and associated transient power distribution peaking factors shall be determined by analysis within 30 days unless the rod is made OPERABLE earlier. The analysis shall include due allowance for nonuniform fuel depletion in the neighborhood of the inoperable rod. If the analysis results in a more limiting hypothetical transient than the cases reported in the safety analysis, the plant power level shall be reduced to an analytically determined part power level which is consistent with the safety analysis.

h. Rod Drop Time

At OPERATING temperature and full flow, the drop time of each full length rod cluster control shall be no greater than 1.8 seconds from loss of stationary gripper coil voltage to dashpot entry. If drop time is > 1.8 seconds, the rod shall be declared inoperable.

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If one or both of the quadrant power tilt monitors is inoperable, individual upper and lower excore detector calibrated outputs and the quadrant tilt shall be logged once per shift and after a load change > 10% of rated power or after > 24 steps of control rod motion. The monitors shall be set to alarm at 2% tilt ratio.

k. Core Average Temperature

During steady-state power operation, $T_{ave}$ shall be maintained within the limits specified in the COLR, except as provided by TS 3.10.n.

l. Reactor Coolant System Pressure

During steady-state power operation, Reactor Coolant System pressure shall be maintained within the limits specified in the COLR, except as provided by TS 3.10.n.

m. Reactor Coolant Flow

1. During steady-state power operation, reactor coolant total flow rate shall be ≥ 178,000 gallons per minute average and greater than or equal to the limit specified in the COLR. If reactor coolant flow rate is not within the limits as specified in the COLR, action shall be taken in accordance with TS 3.10.n.

2. Compliance with this flow requirement shall be demonstrated by verifying the reactor coolant flow during initial power escalation following each REFUELING, at or above 90% power with plant parameters as constant as practical.

n. DNBR Parameters

If, during power operation any of the conditions of TS 3.10.k, TS 3.10.l, or TS 3.10.m.1 are not met, restore the parameter in two hours or less to within limits or reduce power to < 5% of thermal rated power within an additional six hours. Following analysis, thermal power may be raised not to exceed a power level analyzed to maintain a DNBR greater than the minimum DNBR limit.

ENCLOSURE 4

NUCLEAR MANAGEMENT COMPANY, LLC
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**5 pages follow**

The time limits of six hours to achieve HOT STANDBY and an additional six hours to achieve HOT SHUTDOWN allow for a safe and orderly shutdown sequence and are consistent with most of the remainder of the Technical Specifications.

Rod Misalignment Limitations (TS 3.10.e)

During normal power operation it is desirable to maintain the rods in alignment with their respective banks to provide consistency with the assumption of the safety analyses, to maintain symmetric neutron flux and power distribution profiles, to provide assurance that peaking factors are within acceptable limits and to assure adequate shutdown margin.

Analyses have been performed which indicate that the above objectives will be met if the rods are aligned within the limits of TS 3.10.e. A relaxation in those limits for power levels < 85% is allowable because of the increased margin in peaking factors and available shutdown margin obtained while OPERATING at lower power levels. This increased flexibility is desirable to account for the nonlinearity inherent in the rod position indication system and for the effects of temperature and power as seen on the rod position indication system.

Rod position measurement is performed through the effects of the rod drive shaft metal on the output voltage of a series of vertically stacked coils located above the head of the reactor pressure vessel. The rod position can be determined by the analog individual rod position indicators (IRPI), the plant process computer which receives a voltage input from the conditioning module, or through the conditioning module output voltage via a correlation of rod position vs. voltage.

The plant process computer converts the output voltage signal from each IRPI conditioning module to an equivalent position (in steps) through a curve fitting process, which may include the latest actual voltage-to-position rod calibration curve.

The rod position as determined by any of these methods can then be compared to the bank demand position which is indicated on the group step counters to determine the existence and magnitude of a rod misalignment. This comparison is performed automatically by the plant process computer. The rod deviation monitor on the annunciator panel is activated (or reactivated) if the two position signals for any rod as detected by the process computer deviate by more than a predetermined value. The value of this setpoint is set to warn the operator when the Technical Specification limits are exceeded.

The rod position indicator system is calibrated once per REFUELING cycle and forms the basis of the correlation of rod position vs. voltage. This calibration is typically performed at HOT SHUTDOWN conditions prior to initial operations for that cycle. Upon reaching full power conditions and verifying that the rods are aligned with their respective banks, the rod position indication may be adjusted to compensate for the effects of the power ascension. After this adjustment is performed, the calibration of the rod position indicator channel is checked at an intermediate and low level to confirm that the calibration is not adversely affected by the adjustment.

A note indicating individual control rod position indications may not be within limits for up to and including one hour following substantial control rod movement modifies this LCO. This allows up to one hour of thermal soak time to allow the control rod drive shaft to reach thermal equilibrium and thus present a consistent position indication. Substantial rod movement is considered to be 10 or more steps in one direction in less than or equal to one hour

Inoperable Rod Position Indicator Channels (TS 3.10.f)

The axial position of shutdown rods and control rods are determined by two separate and independent systems: the Bank Demand Position Indication System (commonly called group step counters) and the Individual Rod Position Indication (IRPI) System.

The Bank Demand Position Indication System counts the pulses from the Rod Control System that move the rods. There is one step counter for each group of rods. Individual rods in a group all receive the same signal to move and should, therefore, all be at the same position indicated by the group step counter for that group. The Bank Demand Position Indication System is considered highly precise (± 1 step or ± 5/8 inch). If a rod does not move one step for each demand pulse, the step counter will still count the pulse and incorrectly reflect the position of the rod.

The IRPI System provides an indirect indication of actual control rod position, but at a lower precision than the step counters. The rod position indicator channel is sufficiently accurate to detect a rod ± 12 steps away from its demand position. If the rod position indicator channel is not OPERABLE, special surveillance of core power tilt indications, using established procedures and relying on movable incore detectors, will be used to verify power distribution symmetry.

A note indicating individual control rod position indications may not be within limits for up to and including one hour following substantial control rod movement modifies this LCO. This allows up to one hour of thermal soak time to allow the control rod drive shaft to reach thermal equilibrium and thus present a consistent position indication. Substantial rod movement is considered to be 10 or more steps in one direction in less than or equal to one hour.

~~A second note indicates that the required action of verifying rod position by core instruments may also be satisfied by ensuring that $F_Q$ satisfies TS 3.10.b.1.A ($F_Q^N(Z)$), TS 3.10.b.5 ($F_Q^{EQ}$), $F_{\Delta H}^N$ satisfies TS 3.10.b.1.B, and SHUTDOWN MARGIN satisfies TS 3.10.a. Limits may be violated with control or shutdown rods operating outside their limits. Therefore, the acceptance criteria for rod position indication is that rod positions must be known with sufficient accuracy in order to verify the core is operating within the COLR limits.~~

3.10.f.1
When one IRPI channel per group fails, the position of the rod may be determined indirectly by use of the movable incore detectors. The required action may also be satisfied by ensuring at least once per 8 hours that $F_Q$ satisfies TS 3.10.b.1.A ($F_Q^N(Z)$), TS 3.10.b.5 ($F_Q^{EQ}$), $F_{\Delta H}^N$ satisfies TS 3.10.b.1.B, and SHUTDOWN MARGIN satisfies TS 3.10.a, provided the non-indicating rods have not been moved. Based on experience, normal power operation does not require excessive movement of banks. If a bank has been significantly moved (≥ 24 steps), the required action of TS 3.10.f.3 is required. Therefore, verification of RCCA position within the completion time of 8 hours is adequate for allowing continued full power operation, since the probability of simultaneously having a rod significantly out of position and an event sensitive to that rod position is small. A reduction of reactor thermal power to ≤ 50% RATED POWER puts the core into a condition where COLR limits are sufficiently relaxed such that rod position will not cause the core to violate COLR limits[2]. The allowed completion time of 8 hours is reasonable, based on operating experience, for reducing power to ≤ 50% RATED POWER from full power conditions without challenging plant systems and allowing for rod position determination by movable incore detectors.

[2] USAR Chapter 14

3.10.f.2
When more than one IRPI per group fail, additional actions are necessary to ensure that acceptable power distribution limits are maintained, minimum SDM is maintained, and the potential effects of rod misalignment on associated accident analyses are limited. Placing the Rod Control System in manual assures unplanned rod motion with not occur. Together with the indirect position determination available via movable incore detectors will minimize the potential for rod misalignment. The immediate completion time for placing the Rod Control System in manual reflects the urgency with which unplanned rod motion must be prevented while in this condition. Monitoring and recording reactor coolant $T_{avg}$ helps assure that significant changes in power distribution and SDM are avoided. The once per hour completion time is acceptable because only minor fluctuations in RCS temperature are expected at steady state plant operating conditions. The position of the rods may be determined indirectly by use of the movable incore detectors. The required action may also be satisfied by ensuring at least once per 8 hours that $F_Q$ satisfies TS 3.10.b.1.A ($F_Q^N(Z)$), TS 3.10.b.5 ($F_Q^{EQ}$), $F_{\Delta H}^N$ satisfies TS 3.10.b.1.B, and SHUTDOWN MARGIN satisfies TS 3.10.a, provided the non-indicating rods have not been moved. Verification of control rod position once per 8 hours is adequate for allowing continued full power operation for a limited, 24 hour period, since the probability of simultaneously having a rod significantly out of position and an event sensitive to that rod position is small. The 24-hour completion time provides sufficient time to troubleshoot and restore the IRPI system to operation while avoiding the plant challenges associated with the shutdown without full rod position indication.

3.10.f.3
Based on operating experience, normal power operation does not require excessive rod movement. If one or more rods has been significantly moved. When one or more rods with inoperable position indicators have been moved in excess of 24 steps in one direction, since the position was last determined, the required actions of one or more inoperable individual rod position indicators, as applicable, are still appropriate but must be initiated under TS 3.10.f.3 to begin verifying that these rods are still properly positioned, relative to their group positions. If, within 4 hours, the rod positions have not been determined, thermal power must be reduced to ≤ 50% RATED POWER within 8 hours to avoid undesirable power distributions that could result from continued operation at > 50% RATED POWER, if one or more rods are misaligned by more than 24 steps. The allowed completion time of 4 hours provides an acceptable period of time to verify the rod positions.

3.10.f.4
With one demand position indicator per bank inoperable, the IRPI System can determine the rod positions. Since normal power operation does not require excessive movement of rods, verification by administrative means (logging IRPI position and verifying within rod alignment limitations) that the rod position indicators are OPERABLE and the most withdrawn rod and the least withdrawn rod are ≤ 12 steps apart when operating at > 85% RATED POWER or ≤ 24 steps apart when operating at ≤ 85% RATED POWER within the allowed Completion Time of once every 8 hours is adequate. A reduction of reactor thermal power to ≤ 50% RATED POWER puts the core into a condition where COLR limits are sufficiently relaxed such that rod position will not cause the core to violate COLR limits. The allowed completion time of 8 hours provides an acceptable period of time to verify the rod positions or reduce power to ≤ 50% RATED POWER.

~~The rod position indicator channel is sufficiently accurate to detect a rod ± 12 steps away from its demand position. If the rod position indicator channel is not OPERABLE, then the operator will be fully aware of the inoperability of the channel, and special surveillance of core power tilt indications, using established procedures and relying on excore nuclear detectors, and/or movable incore detectors, will be used to verify power distribution symmetry.~~

Inoperable Rod Limitations (TS 3.10.g)

One inoperable control rod is acceptable provided the potential consequences of accidents are not worse than the cases analyzed in the safety analysis report. A 30-day period is provided for the reanalysis of all accidents sensitive to the changed initial condition.

Rod Drop Time (TS 3.10.h)

The required drop time to dashpot entry is consistent with safety analysis.

Core Average Temperature (TS 3.10.k)

The core average temperature limit is consistent with full power operation within the nominal operational envelope. Either Tavg control board indicator readings or computer indications are averaged to obtain the value for comparison to the limit. The limit is based on the average of either 4 control board indicator readings or 4 computer indications. A higher Tavg will cause the reactor core to approach DNB limits.

Reactor Coolant System Pressure (TS 3.10.l)

The RCS pressure limit is consistent with operation within the nominal operational envelope. Either pressurizer pressure control board indicator readings or computer indications are averaged to obtain the value for comparison to the limit. The limit is based on the average of either 4 control board indicator readings or 4 computer indications. A lower pressure will cause the reactor core to approach DNB limits.

Reactor Coolant Flow (TS 3.10.m)

The reactor coolant system (RCS) flow limit, as specified in the COLR, is consistent with the minimum RCS flow limit assumed in the safety analysis adjusted by the measurement uncertainty. The safety analysis assumes initial conditions for plant parameters within the normal steady state envelope. The limits placed on the RCS pressure, temperature, and flow ensure that the minimum departure from nucleate boiling ratio (DNBR) will be met for each of the analyzed transients.

The RCS flow normally remains constant during an operational fuel cycle with all reactor coolant pumps running. At least two plant computer readouts from the loop RCS flow instrument channels are averaged per reactor coolant loop and the sum of the reactor coolant loop flows are compared to the limit. Operating within this limit will result in meeting the DNBR criterion in the event of a DNB-limited event.

DNBR Parameters (TS 3.10.n)

The DNBR related safety analyses make assumptions on reactor temperature, pressure, and flow. In the event one of these parameters does not meet the TS 3.10.k, TS 3.10.l or TS 3.10.m limits, an analysis can be performed to determine a power level at which the MDNBR limit is satisfied.

ENCLOSURE 5

NUCLEAR MANAGEMENT COMPANY, LLC
REVISED TECHNICAL SPECIFICATION BASIS PAGES
KEWAUNEE NUCLEAR POWER PLANT, OPERATING LICENSE NO. DPR-43
DOCKET NO. 50-305

5 pages follow

The time limits of six hours to achieve HOT STANDBY and an additional six hours to achieve HOT SHUTDOWN allow for a safe and orderly shutdown sequence and are consistent with most of the remainder of the Technical Specifications.

Rod Misalignment Limitations (TS 3.10.e)

During normal power operation it is desirable to maintain the rods in alignment with their respective banks to provide consistency with the assumption of the safety analyses, to maintain symmetric neutron flux and power distribution profiles, to provide assurance that peaking factors are within acceptable limits and to assure adequate shutdown margin.

Analyses have been performed which indicate that the above objectives will be met if the rods are aligned within the limits of TS 3.10.e. A relaxation in those limits for power levels < 85% is allowable because of the increased margin in peaking factors and available shutdown margin obtained while OPERATING at lower power levels. This increased flexibility is desirable to account for the nonlinearity inherent in the rod position indication system and for the effects of temperature and power as seen on the rod position indication system.

Rod position measurement is performed through the effects of the rod drive shaft metal on the output voltage of a series of vertically stacked coils located above the head of the reactor pressure vessel. The rod position can be determined by the analog individual rod position indicators (IRPI), the plant process computer which receives a voltage input from the conditioning module, or through the conditioning module output voltage via a correlation of rod position vs. voltage.

The plant process computer converts the output voltage signal from each IRPI conditioning module to an equivalent position (in steps) through a curve fitting process, which may include the latest actual voltage-to-position rod calibration curve.

The rod position as determined by any of these methods can then be compared to the bank demand position which is indicated on the group step counters to determine the existence and magnitude of a rod misalignment. This comparison is performed automatically by the plant process computer. The rod deviation monitor on the annunciator panel is activated (or reactivated) if the two position signals for any rod as detected by the process computer deviate by more than a predetermined value. The value of this setpoint is set to warn the operator when the Technical Specification limits are exceeded.

The rod position indicator system is calibrated once per REFUELING cycle and forms the basis of the correlation of rod position vs. voltage. This calibration is typically performed at HOT SHUTDOWN conditions prior to initial operations for that cycle. Upon reaching full power conditions and verifying that the rods are aligned with their respective banks, the rod position indication may be adjusted to compensate for the effects of the power ascension. After this adjustment is performed, the calibration of the rod position indicator channel is checked at an intermediate and low level to confirm that the calibration is not adversely affected by the adjustment.

A note indicating individual control rod position indications may not be within limits for up to and including one hour following substantial control rod movement modifies this LCO. This allows up to one hour of thermal soak time to allow the control rod drive shaft to reach thermal equilibrium and thus present a consistent position indication. Substantial rod movement is considered to be 10 or more steps in one direction in less than or equal to one hour

Inoperable Rod Position Indicator Channels (TS 3.10.f)

The axial position of shutdown rods and control rods are determined by two separate and independent systems: the Bank Demand Position Indication System (commonly called group step counters) and the Individual Rod Position Indication (IRPI) System.

The Bank Demand Position Indication System counts the pulses from the Rod Control System that move the rods. There is one step counter for each group of rods. Individual rods in a group all receive the same signal to move and should, therefore, all be at the same position indicated by the group step counter for that group. The Bank Demand Position Indication System is considered highly precise (± 1 step or ± 5/8 inch). If a rod does not move one step for each demand pulse, the step counter will still count the pulse and incorrectly reflect the position of the rod.

The IRPI System provides an indirect indication of actual control rod position, but at a lower precision than the step counters. The rod position indicator channel is sufficiently accurate to detect a rod ± 12 steps away from its demand position. If the rod position indicator channel is not OPERABLE, special surveillance of core power tilt indications, using established procedures and relying on movable incore detectors, will be used to verify power distribution symmetry.

A note indicating individual control rod position indications may not be within limits for up to and including one hour following substantial control rod movement modifies this LCO. This allows up to one hour of thermal soak time to allow the control rod drive shaft to reach thermal equilibrium and thus present a consistent position indication. Substantial rod movement is considered to be 10 or more steps in one direction in less than or equal to one hour.

3.10.f.1
When one IRPI channel per group fails, the position of the rod may be determined indirectly by use of the movable incore detectors. The required action may also be satisfied by ensuring at least once per 8 hours that $F_Q$ satisfies TS 3.10.b.1.A ($F_Q^N(Z)$), TS 3.10.b.5 ($F_Q^{EQ}$), $F_{\Delta H}^N$ satisfies TS 3.10.b.1.B, and SHUTDOWN MARGIN satisfies TS 3.10.a, provided the non-indicating rods have not been moved. Based on experience, normal power operation does not require xcessive movement of banks. If a bank has been significantly moved (≥ 24 steps), the required action of TS 3.10.f.3 is required. Therefore, verification of RCCA position within the completion time of 8 hours is adequate for allowing continued full power operation, since the probability of simultaneously having a rod significantly out of position and an event sensitive to that rod position is small. A reduction of reactor thermal power to ≤ 50% RATED POWER puts the core into a condition where COLR limits are sufficiently relaxed such that rod position will not cause the core to violate COLR limits[2]. The allowed completion time of 8 hours is reasonable, based on operating experience, for reducing power to ≤ 50% RATED POWER from full power conditions without challenging plant systems and allowing for rod position determination by movable incore detectors.

3.10.f.2
When more than one IRPI per group fail, additional actions are necessary to ensure that acceptable power distribution limits are maintained, minimum SDM is maintained, and the potential effects of rod misalignment on associated accident analyses are limited. Placing the Rod Control System in manual assures unplanned rod motion with not occur. Together with the

[2] USAR Chapter 14

indirect position determination available via movable incore detectors will minimize the potential for rod misalignment. The immediate completion time for placing the Rod Control System in manual reflects the urgency with which unplanned rod motion must be prevented while in this condition. Monitoring and recording reactor coolant $T_{avg}$ helps assure that significant changes in power distribution and SDM are avoided. The once per hour completion time is acceptable because only minor fluctuations in RCS temperature are expected at steady state plant operating conditions. The position of the rods may be determined indirectly by use of the movable incore detectors. The required action may also be satisfied by ensuring at least once per 8 hours that $F_Q$ satisfies TS 3.10.b.1.A ($F_Q^N(Z)$), TS 3.10.b.5 ($F_Q^{EQ}$), $F_{\Delta H}^N$ satisfies TS 3.10.b.1.B, and SHUTDOWN MARGIN satisfies TS 3.10.a, provided the non-indicating rods have not been moved. Verification of control rod position once per 8 hours is adequate for allowing continued full power operation for a limited, 24 hour period, since the probability of simultaneously having a rod significantly out of position and an event sensitive to that rod position is small. The 24-hour completion time provides sufficient time to troubleshoot and restore the IRPI system to operation while avoiding the plant challenges associated with the shutdown without full rod position indication.

3.10.f.3
Based on operating experience, normal power operation does not require excessive rod movement. If one or more rods has been significantly moved. When one or more rods with inoperable position indicators have been moved in excess of 24 steps in one direction, since the position was last determined, the required actions of one or more inoperable individual rod position indicators, as applicable, are still appropriate but must be initiated under TS 3.10.f.3 to begin verifying that these rods are still properly positioned, relative to their group positions. If, within 4 hours, the rod positions have not been determined, thermal power must be reduced to ≤ 50% RATED POWER within 8 hours to avoid undesirable power distributions that could result from continued operation at > 50% RATED POWER, if one or more rods are misaligned by more than 24 steps. The allowed completion time of 4 hours provides an acceptable period of time to verify the rod positions.

3.10.f.4
With one demand position indicator per bank inoperable, the IRPI System can determine the rod positions. Since normal power operation does not require excessive movement of rods, verification by administrative means (logging IRPI position and verifying within rod alignment limitations) that the rod position indicators are OPERABLE and the most withdrawn rod and the least withdrawn rod are ≤ 12 steps apart when operating at > 85% RATED POWER or ≤ 24 steps apart when operating at ≤ 85% RATED POWER within the allowed Completion Time of once every 8 hours is adequate. A reduction of reactor thermal power to ≤ 50% RATED POWER puts the core into a condition where COLR limits are sufficiently relaxed such that rod position will not cause the core to violate COLR limits. The allowed completion time of 8 hours provides an acceptable period of time to verify the rod positions or reduce power to ≤ 50% RATED POWER.

Inoperable Rod Limitations (TS 3.10.g)

One inoperable control rod is acceptable provided the potential consequences of accidents are not worse than the cases analyzed in the safety analysis report. A 30-day period is provided for the reanalysis of all accidents sensitive to the changed initial condition.

Rod Drop Time (TS 3.10.h)

The required drop time to dashpot entry is consistent with safety analysis.

Core Average Temperature (TS 3.10.k)

The core average temperature limit is consistent with full power operation within the nominal operational envelope. Either Tavg control board indicator readings or computer indications are averaged to obtain the value for comparison to the limit. The limit is based on the average of either 4 control board indicator readings or 4 computer indications. A higher Tavg will cause the reactor core to approach DNB limits.

Reactor Coolant System Pressure (TS 3.10.l)

The RCS pressure limit is consistent with operation within the nominal operational envelope. Either pressurizer pressure control board indicator readings or computer indications are averaged to obtain the value for comparison to the limit. The limit is based on the average of either 4 control board indicator readings or 4 computer indications. A lower pressure will cause the reactor core to approach DNB limits.

Reactor Coolant Flow (TS 3.10.m)

The reactor coolant system (RCS) flow limit, as specified in the COLR, is consistent with the minimum RCS flow limit assumed in the safety analysis adjusted by the measurement uncertainty. The safety analysis assumes initial conditions for plant parameters within the normal steady state envelope. The limits placed on the RCS pressure, temperature, and flow ensure that the minimum departure from nucleate boiling ratio (DNBR) will be met for each of the analyzed transients.

The RCS flow normally remains constant during an operational fuel cycle with all reactor coolant pumps running. At least two plant computer readouts from the loop RCS flow instrument channels are averaged per reactor coolant loop and the sum of the reactor coolant loop flows are compared to the limit. Operating within this limit will result in meeting the DNBR criterion in the event of a DNB-limited event.

DNBR Parameters (TS 3.10.n)

The DNBR related safety analyses make assumptions on reactor temperature, pressure, and flow. In the event one of these parameters does not meet the TS 3.10.k, TS 3.10.l or TS 3.10.m limits, an analysis can be performed to determine a power level at which the MDNBR limit is satisfied.