



Prairie Island Nuclear Generating Plant
Nuclear Management Company, LLC
1717 Wakonade Dr. East • Welch MN 55089

March 11, 2003

L-PI-03-019
10 CFR 50.90

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

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

Docket Nos. 50-282 License Nos. DPR-42
50-306 DPR-60

**License Amendment Request dated March 11, 2003
Addition of Limiting Condition for Operation (LCO) Note
Allowing One Hour Soak Time in Specifications 3.1.4 and 3.1.7**

Attached is a request for change to the Technical Specifications, Appendix A of the Operating Licenses, for the Prairie Island Nuclear Generating Plant (PINGP). The Nuclear Management Company (NMC) submits this request in accordance with the provisions of 10 CFR 50.90.

Prairie Island Technical Specification (TS) 3.1.7 with its associated Surveillance Requirements (SRs) and Bases require rod position indication (RPI) for each control rod to be within 12 steps of the demand position indication when a control rod is in the middle region of the core (> 30 and < 215 steps) or within 24 steps of the demand position indication when the control rod is at the lower or upper ends of rod travel (≤ 30 or ≥ 215 steps). Similarly, the Bases for TS 3.1.4 require the rod position indication to be within these same limits for the control rods to be considered properly aligned.

Prairie Island has experienced difficulty in maintaining RPI within these limits, following substantial rod movement, which has been attributed to thermal instabilities that affect the accuracy of this instrumentation system. It has also been Prairie Island's experience that when the control rod drive mechanism has had some time to reach thermal equilibrium, "soak time", that the RPI returns to within its limits. This license amendment request (LAR) proposes to allow up to one hour of soak time following substantial rod movement during which individual RPIs may not be within their limits. This one-hour extension will allow sufficient time for the control rod drive mechanism to reach thermal equilibrium and the RPIs to return within limits and thus avoid unnecessary entry into a TS Condition.

A001

The RPI system is common to many Westinghouse nuclear plants that have similar experiences with RPI short term operational difficulties. Thus other plants have NRC approved one-hour soak time allowed for their RPIs, specifically Salem Units 1 and 2, Indian Point Unit 3 and Point Beach Units 1 and 2.

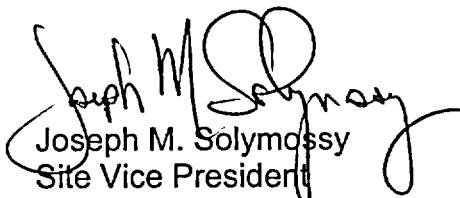
Exhibit A contains a description of the specific proposed changes, the reasons for requesting the changes, the supporting Safety Evaluation, and the proposed Determination of No Significant Hazards Consideration. Exhibit B contains Prairie Island Technical Specification and Bases pages marked up to show the proposed changes. Exhibit C contains the revised Prairie Island Technical Specification and Bases pages incorporating the proposed changes.

NMC is notifying the State of Minnesota of this LAR by transmitting a copy of this letter and attachments to the designated State Official.

The difficulty Prairie Island has experienced with RPI deviation following rod motion has been particularly problematical during reactor startup following a refueling outage. For this reason, NMC requests the NRC to review and approve this LAR by September 11, 2003 to allow implementation prior to the Unit 2 Fall 2003 refueling outage.

This letter contains no new commitments and no revisions to existing commitments. Please address any comments or questions regarding this LAR to Mr. Dale Vincent or myself at 1-651-388-1121.

I declare under penalty of perjury that the foregoing is true and accurate. Executed on March 11, 2003.



Joseph M. Solymossy
Site Vice President
Prairie Island Nuclear Generating Plant

(Distribution and attachments listed on page 3)

C: Regional Administrator - Region III, NRC
Senior Resident Inspector, NRC
NRR Project Manager, NRC
Glenn Wilson, State of Minnesota

Attachments:

Exhibit A, Description of Proposed Changes, Reasons for Requesting the Changes,
Supporting Safety Evaluation and proposed Determination of No
Significant Hazards Consideration

Exhibit B, Marked Up Pages

Exhibit C, Revised Pages

EXHIBIT A

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

License Amendment Request dated March 11, 2003
Addition of Limiting Condition for Operation (LCO) Note
Allowing One Hour Soak Time in Specifications 3.1.4 and 3.1.7

Description of Proposed Changes, Reasons for Requesting the Changes, Supporting Safety Evaluation and proposed Determination of No Significant Hazards Consideration

Pursuant to 10 CFR Part 50, Section 50.90, the holders of Operating Licenses DPR-42 and DPR-60 hereby propose the following changes to the Technical Specifications (TS) contained in Appendix A of the Facility Operating Licenses:

BACKGROUND

Technical Specification 3.1.4, "Rod Group Alignment Limits," requires the reactor control rods to be within alignment limits during MODES 1 and 2 and Technical Specification 3.1.7, "Rod Position Indication," requires the Rod Position Indication (RPI) System to be OPERABLE during MODES 1 and 2. As directed by the associated Bases for 3.1.4, the plant operators use the RPI system as the indication that the control rods are properly aligned.

Bases page B 3.1.4-3 states,

With an indicated deviation of 12 steps between the group step counter and RPI, the maximum deviation between actual rod position and the demand position could be 24 steps, or 15 inches. At the lower and upper ends of rod travel with an indicated deviation of 24 steps between the group step counter and RPI, the deviation between actual rod position and the demand position could be 36 steps, or 22.5 inches.

Bases page B 3.1.7-3 states,

For the control rod position indicators to be OPERABLE requires the following:

- a. The RPI System indicates within 12 steps of the group step counter demand position when the demand position is between 30 and 215 steps, or within 24 steps of their group step counter demand position when the demand position is greater than or equal to 215 steps, or less than or equal to 30 steps;

The Bases for Specification 3.1.7 require the individual RPI for each control rod to be within 12 steps of the demand position indication when a control rod is in the middle region of the core (> 30 and < 215 steps) or within 24 steps of the demand position indication when the control rod is at the lower or upper ends of rod travel (≤ 30 or ≥ 215 steps). The Bases for Specification 3.1.4 require the rod position indication to be within the same limits for the rods to be considered within alignment. In accordance with these current TS and their Bases, indications outside these limits mean the RPI is inoperable and a control rod may be misaligned and the appropriate TS Conditions and Required Actions must be entered.

The RPI system provides an analog signal of actual control rod position for each rod by a position transmitter. An electrical coil stack linear variable differential transformer is placed above the stepping mechanisms of the control rod magnetic jacks external to the pressure housing. When the associated control rod is at the bottom of the core, the magnetic coupling between primary and secondary windings is small and there is a small voltage induced in the secondary. As the control rod is raised by the magnetic jacks, the relatively high permeability of the lift rod causes an increase in magnetic coupling. Thus, an analog signal proportional to rod position is derived.

It is not uncommon for Prairie Island Units 1 and 2 to experience difficulty, following and during substantial rod movements, in maintaining the indicated differences between RPI and demand position indication within the limits described above. The differences typically return to within limits within an hour after rod motion has been terminated. These short-term deviations are attributed to changes in the magnetic permeability of the drive shaft as a function of temperature. As the control rod drive shaft reaches thermal equilibrium, the deviation decreases and returns to within limits.

This license amendment request (LAR) proposes to allow up to one hour of "soak time" following substantial rod movement during which the rod position indication may be outside its limits. This soak time will allow sufficient time for the control rod drive shaft to reach thermal equilibrium and RPIs to return within limits and thus avoid unnecessary entry into a TS Condition. The one-hour time period is consistent with NRC approved time allowances at other plants, specifically Salem Units 1 and 2; Point Beach Units 1 and 2; and Indian Point Unit 3.

PROPOSED CHANGES AND JUSTIFICATION OF CHANGES

A brief description of the proposed changes is provided below along with a discussion of the justification for each change. The specific wording changes to the Technical Specifications and Bases are provided in Exhibits B and C.

TS 3.1.4, Rod Group alignment Limits, Limiting Condition for Operation (LCO) and TS 3.1.7, Rod Position Indication, LCO: Add an LCO Note which states, "Individual RPIs may be outside their limits for ≤ 1 hour following substantial rod movement."

Following substantial control rod movement at Prairie Island, individual RPIs may differ from the demand position indication by more than the TS allowed limits for a short time (less than 1 hour) until the control rod drive mechanism reaches thermal equilibrium. The operators are aware of these deviations through their normal monitoring of plant performance. Through the guidance of the TS 3.1.4 Bases the operators have to consider any control rod with rod position indications outside the allowed limits to be misaligned if the RPI instrumentation is known to be OPERABLE. However, the guidance of TS 3.1.7 requires the operators to first consider the RPI instrumentation inoperable until operability can be verified through TS 3.1.7 Condition A Required Actions. Thus, the operators are routinely required to enter TS 3.1.7 Condition A following substantial rod motion for one or more RPIs.

This LAR proposes to add an LCO Note to TS 3.1.4 and TS 3.1.7 which will allow up to one hour of soak time following substantial rod movement during which individual RPIs may be outside their limits. With these LCO Notes, the operators do not have to meet the RPI limits for one hour and can delay entry into the applicable Conditions for an LCO not met. This one-hour time period is based on the time deemed necessary to allow the control rod drive shaft to reach thermal equilibrium.

Bases 3.1.4, Rod Group alignment Limits: Add discussion of the LCO Note that states,

This LCO is modified by 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. 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.

In accordance with this Note, the comparison of bank demand position and RPI may take place at any time up to one hour after rod motion, at any power level. Based on this allowance, rod position may be considered within limits during the thermal soak time to allow position indication to stabilize.

Bases 3.1.7, Rod Position Indication: Add discussion of the LCO Note that states,

This LCO is modified by 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. 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.

In accordance with this Note, the comparison of bank demand position and RPI may take place at any time up to one hour after rod motion, at any power level.

Based on this allowance, position indication may be considered OPERABLE during the thermal soak time to allow position indication to stabilize.

Bases discussion is provided in Bases 3.1.4 and 3.1.7 for the proposed LCO Note in TS 3.1.4 and TS 3.1.7 to explain the purpose of not requiring the RPIs to be within limits for one hour after substantial rod movement. The Bases discussion also clarifies when rod movement is considered substantial.

With the proposed LCO 3.1.4 Note and LCO 3.1.7 Note and Bases the operators can maneuver control rods as required to control plant operations without "nuisance" entry into LCO Conditions and Required Actions. If the RPI and demand position indication continue to differ by more than the TS allowed limits following the one hour soak time, then the operators would be required to enter the appropriate LCO Conditions and Required Actions to determine whether RPI instrumentation is inoperable or a rod is misaligned.

SAFETY EVALUATION

When the control rods have been moved substantially, RPIs will often differ from the demand position indication by more than the TS allowed limits. With current TS, the operators recognize that LCO 3.1.4 rod alignment requirements may not be met and that LCO 3.1.7 RPI OPERABILITY requirements are not met. The operators are required to enter LCO 3.1.7 Condition A. Entry into this Condition entails logging into the "LCO log" and tracking for proper and timely performance of the Required Actions.

LCO 3.1.7 Condition A requires verifying within 8 hours, by moveable incore detectors, the position of the control rod(s) for which the RPI differs from the demand position by more than the TS allowed limits, or reducing power to less than 50% RTP within 8 hours. Since both of these actions do not need to be performed for 8 hours, the operators do not take any immediate reactor operational remedial actions. The operators notify the Nuclear Engineering Group and request them to prepare to perform an incore flux map using the moveable incore detectors. They also monitor the behavior of the RPI(s) to determine if the rod position indication returns to within limits. Typically within 30 minutes the RPI difference from the demand position returns to within limits. When the RPI returns to within limits in 30 minutes, in accordance with LCO 3.0.2, the LCO is met prior to expiration of the Completion Time and completion of the Required Actions is not required for LCO 3.1.7. The operators then exit LCO 3.1.7 Condition A which involves logging out of the "LCO log" including performance of the required administrative tasks and notifying the Nuclear Engineering Group that a flux map will not be required. Since this scenario repeats each time there is substantial control rod movement and no substantive remedial actions are required, this is considered a "nuisance" LCO Condition entry.

This unnecessary entry into LCO 3.1.7 Condition A distracts the operators from monitoring reactor operations and performing other tasks more important to plant safety. Unnecessary entry into LCO 3.1.7 Condition A also involves unnecessary testing, and preparation and operation of the moveable incore detector system which results in increased wear on the system.

This LAR proposes to add an LCO Note to LCO 3.1.4 and LCO 3.1.7 and associated Bases which will allow one hour soak time during which individual RPIs are not required to be within limits. This one-hour time period is based on the time deemed necessary to allow the control rod drive shaft to reach thermal equilibrium. With these LCO Notes, unnecessary entry into an LCO Condition will be avoided following substantial movement of control rods.

Operators are required to be aware of plant conditions and to meet the applicable TS. With these LCO Notes, the operators will still be required to monitor the RPIs and take the appropriate actions after one hour if the RPI and demand position indication continue to differ by more than the TS allowed limits. Thus, the practical effect of the proposed LCO Notes is to extend by one hour (from 8 hours to 9 hours) the time that individual RPI instrumentation could be inoperable or a rod could be misaligned before TS required remedial actions would be implemented.

The likelihood of having a misaligned control rod and an event sensitive to a significantly misaligned rod is small. For this reason the Completion Time for LCO 3.1.7 Condition C is 8 hours. Since RPI instrumentation is seldom inoperable, the possibility of inoperable RPI instrumentation coincident with a misaligned control rod and an event sensitive to a significantly misaligned rod is even more remote. Thus a one-hour time extension does not introduce significant safety issues with respect to RPI operability. There may also be other RPI instrumentation indications available to the operators that an RPI may be inoperable, such as erratic indications, which may be more meaningful than a difference between the RPI and demand position indication. These other indications could appear independent of rod motion.

There is a small possibility that an individual RPI difference from the demand position indication is a legitimate indication of a misaligned rod. However, this is very unlikely since the plant staff is unaware of any misaligned rod at Prairie Island in over 50 reactor-years of operation. It is the expectation in the use of the Prairie Island TS that differences between RPI and demand position indication will be evaluated first as RPI instrumentation inoperability in accordance with the requirements of TS 3.1.7 Condition A, therefore, a rod could be misaligned for 8 hours prior to identification as a misaligned rod. This proposed change would extend the time by an additional hour. The likelihood of an event sensitive to a significantly misaligned rod during this one-hour time period is low.

The plant is analyzed for control rod misalignment. The minimum misalignment for individual rods assumed in the safety analyses is 24 steps (15 inches), and in some

cases a total misalignment from fully withdrawn to fully inserted is assumed. Plant safety analyses consider two types of rod misalignment events, static misalignment and a dropped rod. The analyses show that a single dropped rod event, without any operator intervention, does not result in any fuel pin failure, therefore the rod drop event is not time dependent and an additional hour with the misalignment undetected and unmitigated does not adversely impact plant safety. Multiple rod drop events cause the reactor to trip and therefore an additional hour would not have any impact on this event.

In the static misalignment event, one or more control rods are assumed to be statically misplaced from the allowed position. This situation might occur if a rod were left behind when inserting or withdrawing banks, or if a single rod were to be withdrawn. The analysis of this event is bounded by modeling the most limiting configuration which is the control banks at the full power insertion limit except for a single control rod fully withdrawn. The analyses show that, without any operator intervention, a single fully withdrawn rod event does not result in any fuel pin failure, therefore the static rod misalignment event is not time dependent and an additional hour with the misalignment undetected and unmitigated does not adversely impact plant safety. Multiple rod misalignment events are bounded by the single rod misalignment event analyses and therefore an additional hour would not have any impact on this event.

The proposed one-hour extension does not significantly impact the safety of the plant. Allowing the operator and engineers to focus on monitoring the reactor without unnecessary entry into an LCO Condition and Required Actions may enhance plant safety and reliability of plant equipment. With these proposed changes, the Prairie Island TS will continue to protect the health and safety of the public.

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION

This license amendment request proposes to add a limiting condition for operation (LCO) Note to LCO 3.1.4 and LCO 3.1.7 and supporting discussion in their associated Bases to allow up to one hour of soak time following substantial rod movement during which time the rod position indication may be outside its limits. This time will allow sufficient time for the control rod drive mechanism to reach thermal equilibrium and rod position indication to return within limits and thus avoid unnecessary entry into a Technical Specification Condition. The practical effect of this change is a one-hour extension of the time that a rod position indication may be inoperable or a control rod may be misaligned prior to requiring remedial actions. The NRC has approved similar one-hour soak time extension for other nuclear plant licensees.

1. The proposed amendment will not involve a significant increase in the probability or consequences of an accident previously evaluated.

This license amendment request proposes to allow up to one hour of soak time following substantial rod movement during which time the rod position indication may be outside its limits. This would allow an additional hour for rod position indication to be inoperable or a control rod to be misaligned prior to entry into a Technical Specification LCO Condition and Required Actions.

Rod position indication instrumentation is not an assumed accident initiator and thus this change does not involve a significant increase in the probability of an accident. Rod position indication instrumentation provides information on control rod position. Inoperable rod position indication instrumentation for an additional hour does not make a rod misaligned. The consequences of a rod misaligned for an additional hour are considered separately, thus inoperable rod position indication instrumentation, by itself, for an additional hour does not involve an increase in the consequences of an accident.

This license amendment request may allow a misaligned rod to be undetected for an additional hour. Plant safety analyses consider two types of rod misalignment events, static misalignment and a dropped rod. This license amendment request does not involve a significant increase in the probability of a misaligned control rod event because the one-hour time extension does not affect the control rod drive system features whose failure would result in either type of misalignment. This proposed one-hour time extension for a control rod to be misaligned does not involve a significant increase in the consequences of a rod misalignment event as follows. The analyses show that a single dropped rod event, without any operator intervention, does not result in any fuel pin failure, therefore the rod drop event is not time dependent and an additional hour with the misalignment undetected and unmitigated does not increase the consequences of the event. Multiple rod drop events cause the reactor to trip and therefore an additional hour would not have any impact on this event.

In the static misalignment event, one or more control rods are assumed to be statically misplaced from the allowed position. This situation might occur if a rod were left behind when inserting or withdrawing banks, or if a single rod were to be withdrawn. The analysis of this event is bounded by modeling the most limiting configuration which is the control banks at the full power insertion limit except for a single control rod fully withdrawn. The analyses show that, without any operator intervention, a single fully withdrawn rod event does not result in any fuel pin failure, therefore the static rod misalignment event is not time dependent and an additional hour with the misalignment undetected and unmitigated does not increase the

consequences of the event. Multiple rod misalignment events are bounded by the single rod misalignment analyses and therefore an additional hour would not have any impact on this event.

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

2. The proposed amendment will not create the possibility of a new or different kind of accident from any accident previously analyzed.

This proposed change does not alter the design, function, or operation of any plant component and does not install any new or different equipment. The malfunction of safety related equipment, assumed to be operable in the accident analyses, would not be caused as a result of the proposed technical specification change. No new failure mode has been created and no new equipment performance burdens are imposed. Therefore the possibility of a new or different kind of accident from those previously analyzed has not been created.

3. The proposed amendment will not involve a significant reduction in the margin of safety.

This license amendment request proposes to allow up to one hour of soak time following substantial rod movement during which time the rod position indication may be outside its limits. This would allow an additional hour for rod position indication instrumentation to be inoperable or a control rod to be misaligned prior to entry into a Technical Specification LCO Condition and Required Actions.

The rod position indication system is an instrumentation system that provides indication to the operators that a control rod may be misaligned. Inoperable individual rod position indication instrumentation does not by itself in any way harm or impact reactor operation. Inoperable rod position indication instrumentation may impair the ability of the operators to detect a misaligned rod. The impact of inoperable rod position indication instrumentation may be offset by availability of other indications that a rod is misaligned such as nuclear instrumentation indication that reactor power has shifted to one side of the core or thermocouple indication that the core temperatures increased in one region of the core and/or decreased in another region of the core.

The Prairie Island staff is not aware of a misaligned control rod in more than 50 reactor-years of plant operation. The likelihood of a misaligned rod at Prairie Island is small and the likelihood of a misaligned rod coincident with inoperable rod position indication during the allowed one hour extension is smaller.

The addition of one hour soak time for the rod position indication instrumentation will allow the operators and engineers to focus on monitoring the reactor performance without unnecessary entry into LCO Conditions and Required Actions with the concomitant administrative activities. Thus these changes may enhance plant safety and reliability of equipment.

In conclusion, the proposed addition of an LCO Note in LCO 3.1.4 and 3.1.7 does not involve a significant reduction in the margin of safety because rod position indication instrumentation inoperability by itself does not impact plant safety, rod misalignment is unlikely, there may be other indications of rod misalignment, rod misalignment coincident with rod position indication instrumentation inoperability within the one hour extension is unlikely, and plant safety may be enhanced by avoiding unnecessary LCO Condition entry.

Considering the above evaluations and pursuant to 10CFR50.91, the Nuclear Management Company has determined that operation of the Prairie Island Nuclear Generating Plant in accordance with the proposed license amendment request does not involve a significant hazards consideration as defined by Nuclear Regulatory Commission regulations in 10CFR50.92.

ENVIRONMENTAL ASSESSMENT

The Nuclear Management Company has evaluated the proposed change and determined that:

1. The changes do not involve a significant hazards consideration,
2. The changes do not involve a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, and
3. The changes do not involve a significant increase in individual or cumulative occupational radiation exposure.

Accordingly, the proposed change meets the eligibility criterion for categorical exclusion set forth in 10CFR51.22(c)(9). Therefore, pursuant to 10CFR51.22(b), an environmental assessment of the proposed changes is not required.

EXHIBIT B

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

License Amendment Request dated March 11, 2003
Addition of Limiting Condition for Operation (LCO) Note
Allowing One Hour Soak Time in Specifications 3.1.4 and 3.1.7

Marked Up Pages

(shaded material to be added, strikethrough material to be removed)

Appendix A, Technical Specification Pages

3.1.4-1

3.1.7-1

Bases Pages

B 3.1.4-6

B 3.1.4-7

B 3.1.4-8

B 3.1.4-9

B 3.1.7-4

B 3.1.7-5

B 3.1.7-6

B 3.1.7-7

B 3.1.7-8

3.1 REACTIVITY CONTROL SYSTEMS

3.1.4 Rod Group Alignment Limits.

LCO 3.1.4 All shutdown and control rods shall be OPERABLE.

AND

Individual actual rod positions shall be within 24 steps of their group step counter demand position when the demand position is between 30 and 215 steps, or within 36 steps of their group step counter demand position when the demand position ≤ 30 steps, or ≥ 215 steps.

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

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more rod(s) inoperable.	A.1.1 Verify SDM is within the limits provided in the COLR.	1 hour
	<u>OR</u>	
	A.1.2 Initiate boration to restore SDM to within limit.	1 hour
	<u>AND</u>	
	A.2 Be in MODE 3.	6 hours

3.1 REACTIVITY CONTROL SYSTEMS

3.1.7 Rod Position Indication

LCO 3.1.7 The Rod Position Indication (RPI) System and demand position indication shall be OPERABLE.

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

APPLICABILITY: MODES 1 and 2.

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each inoperable rod position indicator and each demand position indicator.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One RPI per group inoperable for one or more groups.	A.1 Verify the position of the rod(s) with inoperable position indicators by using movable incore detectors.	Once per 8 hours
	<u>OR</u> A.2 Reduce THERMAL POWER to $\leq 50\%$ RTP.	8 hours

BASES

LCO (continued)

Failure to meet the requirements of this LCO may produce unacceptable power peaking factors and LHRs, or unacceptable SDMs, all of which may constitute initial conditions inconsistent with the safety analysis.

This LCO is modified by 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. 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.

In accordance with this Note, the comparison of bank demand position and RPI may take place at any time up to one hour after rod motion, at any power level. Based on this allowance, rod position may be considered within limits during the thermal soak time to allow position indication to stabilize.

APPLICABILITY

The requirements on RCCA OPERABILITY and alignment are applicable in MODES 1 and 2 because these are the only MODES in which neutron (or fission) power is generated, and the OPERABILITY (i.e., trippability) and alignment of rods have the potential to affect the safety of the plant. In MODES 3, 4, 5, and 6, the alignment limits do not apply because the control rods are normally bottomed and the reactor is shutdown and not producing fission power. In the shutdown MODES, the OPERABILITY of the shutdown and control rods has the potential to affect the required SDM, but this effect can be compensated for by an increase in the boron concentration of the RCS. See LCO 3.1.1, "SHUTDOWN MARGIN (SDM)," for SDM in MODES 3, 4, and 5 and LCO 3.9.1, "Boron Concentration," for boron concentration requirements during refueling.

BASES

ACTIONS

A.1.1 and A.1.2

When one or more rods are inoperable (i.e., untrippable), there is a possibility that the required SDM may be adversely affected. Under these conditions, it is important to determine the SDM, and if it is less than the required value, initiate boration until the required SDM is recovered. The Completion Time of 1 hour is adequate for determining SDM and, if necessary, for initiating boration and restoring SDM.

In this situation, SDM verification must include the worth of the untrippable rod, as well as a rod of maximum worth.

A.2

If the inoperable rod(s) cannot be restored to OPERABLE status, the plant must be brought to a MODE or condition in which the LCO requirements are not applicable. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours.

The allowed Completion Time is reasonable, based on operating experience, for reaching MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

B.1.1 and B.1.2

With a misaligned rod, SDM must be verified to be within limit or boration must be initiated to restore SDM to within limit.

In many cases, realigning the remainder of the group to the misaligned rod may not be desirable. For example, realigning control bank B to a rod that is misaligned 15 steps from the top of the core would require a significant power reduction, since control bank D must be moved fully in and control bank C must be moved in to approximately 100 to 115 steps.

BASES

ACTIONS

B.1.1 and B.1.2 (continued)

Power operation may continue with one RCCA trippable but misaligned, provided that SDM is verified within 1 hour.

The Completion Time of 1 hour represents the time necessary for determining the unit SDM and, if necessary, aligning and starting the necessary systems and components to initiate boration.

B.2.1.1, B.2.1.2, B.2.2, B.3, and B.4

For continued operation with a misaligned rod, hot channel factors ($F_Q(Z)$ and $F_{\Delta H}^N$) must be verified within limits or the high neutron flux trip setpoint must be reduced, SDM must periodically be verified within limits, the safety analyses must be re-evaluated to confirm continued operation is permissible, and, if necessary, the power level must be reduced to a level consistent with the safety analysis. Considerations in these analyses include the potential ejected rod worth and associated transient power distribution peaking factors. The analysis shall include due allowance for nonuniform fuel depletion in the neighborhood of the inoperable rod.

Verifying that $F_Q(Z)$, as approximated by $F_Q^C(Z)$ and $F_Q^W(Z)$, and $F_{\Delta H}^N$ are within the required limits (i.e., SR 3.2.1.1, SR 3.2.1.2 and SR 3.2.2.1) ensures that current operation at RTP with a rod misaligned is not resulting in power distributions that may invalidate safety analysis assumptions at full power. The Completion Time of 8 hours allows sufficient time to obtain flux maps of the core power distribution using the incore flux mapping system and to calculate $F_Q(Z)$ and $F_{\Delta H}^N$.

In lieu of determining hot channel factors ($F_Q(Z)$ and $F_{\Delta H}^N$) within the Completion Time of 8 hours, reducing the high neutron flux trip setpoint to 85% RTP ensures that local LHR increases due to a misaligned RCCA will not cause the core design criteria to be exceeded. The Completion Time of 8 hours gives the operator

BASES

ACTIONS

B.2.1.1, B.2.1.2, B.2.2, B.3, and B.4 (continued)

sufficient time to accomplish an orderly power reduction and setpoint change without challenging the Reactor Protection System.

When a rod is known to be misaligned, there is a potential to impact the SDM. Since the core conditions can change with time, periodic verification of SDM is required. A Frequency of 12 hours is sufficient to ensure this requirement continues to be met.

Once current conditions have been verified acceptable, time is available to perform evaluations of accident analyses to determine that core limits will not be exceeded during a Design Basis Event for the duration of operation under these conditions. The accident analyses presented in Ref. 3 that may be adversely affected will be evaluated to ensure that the analysis results remain valid for the duration of continued operation under these conditions.

If the analyses do not support continued operation at RTP, then the power must be reduced to a level consistent with the safety analyses.

A Completion Time of 30 days is sufficient time to obtain the required input data and to perform the analysis and adjust power level.

C.1

When Required Actions cannot be completed within their Completion Time, the unit must be brought to a MODE or Condition in which the LCO requirements are not applicable. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours, which eliminates concerns about the development of undesirable xenon or power distributions. The allowed Completion Time of 6 hours is reasonable, based on operating experience, for reaching MODE 3 from full power conditions in an orderly manner and without challenging the plant systems.

BASES

LCO (continued)

The 12 step agreement limit between bank demand position indication and the RPI System when the demand position is between 30 and 215 steps indicates that the bank demand position indication is adequately calibrated, and can be used for indication of the measurement of control rod bank position.

A deviation of less than the allowable limit, given above, in position indication for a single control rod, ensures high confidence that the position uncertainty of the corresponding control rod group is within the assumed values used in the analysis (that specified control rod group insertion limits).

These requirements ensure that control rod position indication during power operation and PHYSICS TESTS is accurate, and that design assumptions are not challenged.

OPERABILITY of the position indicator channels ensures that inoperable, misaligned, or mispositioned control rods can be detected. Therefore, power peaking, ejected rod worth, and SDM can be controlled within acceptable limits.

This LCO is modified by 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. 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.

In accordance with this Note, the comparison of bank demand position and RPI may take place at any time up to one hour after rod motion, at any power level. Based on this allowance, position indication may be considered OPERABLE during the thermal soak time to allow position indication to stabilize.

BASES (continued)

APPLICABILITY The requirements on the RPI and step counters are only applicable in MODES 1 and 2 (consistent with LCO 3.1.4, LCO 3.1.5, and LCO 3.1.6), because these are the only MODES in which power is generated, and the OPERABILITY and alignment of rods have the potential to affect the safety of the plant. In the shutdown MODES, the OPERABILITY of the shutdown and control banks has the potential to affect the required SDM, but this effect can be compensated for by an increase in the boron concentration of the Reactor Coolant System. See LCO 3.1.1, "SHUTDOWN MARGIN (SDM)," for SDM requirements in MODE 2 with $k_{\text{eff}} < 1.0$ and MODES 3, 4, and 5 and LCO 3.9.1, "Boron Concentration," for boron concentration requirements during MODE 6.

ACTIONS The ACTIONS table is modified by a Note indicating that a separate Condition entry is allowed for each inoperable RPI and each demand position indicator. This is acceptable because the Required Actions for each Condition provide appropriate compensatory actions for each inoperable position indicator.

A.1

When one RPI channel per group fails, the position of the rod may still be determined indirectly by use of the moveable incore detectors. Based on experience, normal power operation does not require excessive movement of banks. 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. Verification may determine that the RPI is OPERABLE and the rod is misaligned, then the Conditions of LCO 3.1.4, "Rod Group Alignment Limits" must be entered.

BASES

ACTIONS (continued)

A.2

Reduction of THERMAL POWER to $\leq 50\%$ RTP puts the core into a condition where rod position is not significantly affecting core peaking factors.

The allowed Completion Time of 8 hours is reasonable, based on operating experience, for reducing power to $\leq 50\%$ RTP from full power conditions without challenging plant systems and allowing for rod position determination by Required Action A.1 above.

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

When more than one RPI channel per group fails, additional monitoring shall be performed to assure that the reactor remains in a safe condition. The demand position from the group step counters associated with the rods with inoperable position indicators shall be monitored and recorded on an hourly basis. This ensures a periodic assessment of rod position to determine if rod movement in excess of 24 steps has occurred since the last determination of rod position. If rod movement in excess of 24 steps has occurred since the last determination of rod position, the Required Action of B.3 is required.

The reactor coolant system average temperature shall be monitored and recorded on an hourly basis. Monitoring and recording of the reactor coolant system average temperature may provide early detection of mispositioned or dropped rods.

When one or more rods have been moved in excess of 24 steps in one direction, since the position was last determined, action is initiated sooner to begin verifying that these rods are still properly positioned relative to their group positions. The 4 hour allowance for completion of this action allows adequate time to complete the rod position verification using the moveable incore detectors.

The position of rods with inoperable RPIs will also continue to be verified indirectly using the moveable incore detectors every 8 hours

BASES

ACTIONS

(continued)

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

in accordance with Required Action A.1. Using the moveable incore detectors provides further assurance that the rods have not moved.

Based on experience, normal power operation does not require excessive movement of banks. Therefore, the actions specified in this condition are adequate for continued full plant operation for up to 24 hours 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 allowed out of service time also provides sufficient time to troubleshoot and restore the RPI System to operation following a component failure in the system, while avoiding the challenges associated with a plant shutdown.

C.1.1 and C.1.2

Demand position indication is provided by any of the following means: step counters; ERCS; calculations using rod drive cabinet counters and Pulse to Analog counters. With all indication for one demand position per bank inoperable, the rod positions can be determined by the RPI System. Since normal power operation does not require excessive movement of rods, verification by administrative means that the rod position indicators are OPERABLE and the rod position indication of the most withdrawn rod and the rod position indication of the least withdrawn rod are ≤ 12 steps apart within the allowed Completion Time of once every 8 hours is adequate. This ensures that the most withdrawn and least withdrawn rod are no more than 24 steps apart (including instrument uncertainty) which bounds the accident analysis assumptions. This verification can be an examination of logs, administrative controls, or other information that shows that all RPIs in the affected bank are OPERABLE.

BASES

ACTIONS

(continued)

C.2

Reduction of THERMAL POWER to $\leq 50\%$ RTP puts the core into a condition where rod position is not significantly affecting core peaking factor limits. The allowed Completion Time of 8 hours provides an acceptable period of time to verify the rod positions per Required Actions C.1.1 and C.1.2 or reduce power to $\leq 50\%$ RTP.

D.1

If the Required Actions cannot be completed within the associated Completion Time, the plant must be brought to a MODE in which the requirement does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours. The allowed Completion Time is reasonable, based on operating experience, for reaching the required MODE from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE
REQUIREMENTS

SR 3.1.7.1

Verification that the RPI agrees with the demand position within 12 steps (between 30 and 215 steps) or within 24 steps (when ≤ 30 steps or ≥ 215 steps) ensures that the RPI is operating correctly.

This Surveillance is performed prior to reactor criticality after each removal of the reactor head as there is the potential for unnecessary plant transients if the SR were performed with the reactor at power.

REFERENCES

1. AEC "General Design Criteria for Nuclear Power Plant Construction Permits" Criteria 12 and 13, issued for comment July 10, 1967, as referenced in USAR Section 1.2.
2. USAR, Sections 14.4 and 14.5.

EXHIBIT C

PRAIRIE ISLAND NUCLEAR GENERATING PLANT

License Amendment Request dated March 11, 2003
Addition of Limiting Condition for Operation (LCO) Note
Allowing One Hour Soak Time in Specifications 3.1.4 and 3.1.7

Revised Pages

Appendix A, Technical Specification Pages

3.1.4-1

3.1.7-1

Bases Pages

B 3.1.4-6

B 3.1.4-7

B 3.1.4-8

B 3.1.4-9

B 3.1.4-10

B 3.1.4-11

B 3.1.4-12

B 3.1.4-13

B 3.1.7-4

B 3.1.7-5

B 3.1.7-6

B 3.1.7-7

B 3.1.7-8

3.1 REACTIVITY CONTROL SYSTEMS

3.1.4 Rod Group Alignment Limits.

LCO 3.1.4 All shutdown and control rods shall be OPERABLE.

AND

Individual actual rod positions shall be within 24 steps of their group step counter demand position when the demand position is between 30 and 215 steps, or within 36 steps of their group step counter demand position when the demand position ≤ 30 steps, or ≥ 215 steps.

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

APPLICABILITY: MODES 1 and 2.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more rod(s) inoperable.	A.1.1 Verify SDM is within the limits provided in the COLR.	1 hour
	<u>OR</u>	
	A.1.2 Initiate boration to restore SDM to within limit.	1 hour
	<u>AND</u>	
	A.2 Be in MODE 3.	6 hours

3.1 REACTIVITY CONTROL SYSTEMS

3.1.7 Rod Position Indication

LCO 3.1.7 The Rod Position Indication (RPI) System and demand position indication shall be OPERABLE.

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

APPLICABILITY: MODES 1 and 2.

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each inoperable rod position indicator and each demand position indicator.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One RPI per group inoperable for one or more groups.	A.1 Verify the position of the rod(s) with inoperable position indicators by using movable incore detectors.	Once per 8 hours
	<u>OR</u> A.2 Reduce THERMAL POWER to $\leq 50\%$ RTP.	8 hours

BASES

LCO (continued)

Failure to meet the requirements of this LCO may produce unacceptable power peaking factors and LHRs, or unacceptable SDMs, all of which may constitute initial conditions inconsistent with the safety analysis.

This LCO is modified by 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. 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.

In accordance with this Note, the comparison of bank demand position and RPI may take place at any time up to one hour after rod motion, at any power level. Based on this allowance, rod position may be considered within limits during the thermal soak time to allow position indication to stabilize.

APPLICABILITY

The requirements on RCCA OPERABILITY and alignment are applicable in MODES 1 and 2 because these are the only MODES in which neutron (or fission) power is generated, and the OPERABILITY (i.e., trippability) and alignment of rods have the potential to affect the safety of the plant. In MODES 3, 4, 5, and 6, the alignment limits do not apply because the control rods are normally bottomed and the reactor is shutdown and not producing fission power. In the shutdown MODES, the OPERABILITY of the shutdown and control rods has the potential to affect the required SDM, but this effect can be compensated for by an increase in the boron concentration of the RCS. See LCO 3.1.1, "SHUTDOWN MARGIN (SDM)," for SDM in MODES 3, 4, and 5 and LCO 3.9.1, "Boron Concentration," for boron concentration requirements during refueling.

BASES (continued)

ACTIONS

A.1.1 and A.1.2

When one or more rods are inoperable (i.e., untrippable), there is a possibility that the required SDM may be adversely affected. Under these conditions, it is important to determine the SDM, and if it is less than the required value, initiate boration until the required SDM is recovered. The Completion Time of 1 hour is adequate for determining SDM and, if necessary, for initiating boration and restoring SDM.

In this situation, SDM verification must include the worth of the untrippable rod, as well as a rod of maximum worth.

A.2

If the inoperable rod(s) cannot be restored to OPERABLE status, the plant must be brought to a MODE or condition in which the LCO requirements are not applicable. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours.

The allowed Completion Time is reasonable, based on operating experience, for reaching MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

B.1.1 and B.1.2

With a misaligned rod, SDM must be verified to be within limit or boration must be initiated to restore SDM to within limit.

In many cases, realigning the remainder of the group to the misaligned rod may not be desirable. For example, realigning control bank B to a rod that is misaligned 15 steps from the top of the core would require a significant power reduction, since control bank D must be moved fully in and control bank C must be moved

BASES

ACTIONS

B.1.1 and B.1.2 (continued)

in to approximately 100 to 115 steps.

Power operation may continue with one RCCA trippable but misaligned, provided that SDM is verified within 1 hour.

The Completion Time of 1 hour represents the time necessary for determining the unit SDM and, if necessary, aligning and starting the necessary systems and components to initiate boration.

B.2.1.1, B.2.1.2, B.2.2, B.3, and B.4

For continued operation with a misaligned rod, hot channel factors ($F_Q(Z)$ and $F_{\Delta H}^N$) must be verified within limits or the high neutron flux trip setpoint must be reduced, SDM must periodically be verified within limits, the safety analyses must be re-evaluated to confirm continued operation is permissible, and, if necessary, the power level must be reduced to a level consistent with the safety analysis. Considerations in these analyses include the potential ejected rod worth and associated transient power distribution peaking factors. The analysis shall include due allowance for nonuniform fuel depletion in the neighborhood of the inoperable rod.

Verifying that $F_Q(Z)$, as approximated by $F_Q^C(Z)$ and $F_Q^W(Z)$, and $F_{\Delta H}^N$ are within the required limits (i.e., SR 3.2.1.1, SR 3.2.1.2 and SR 3.2.2.1) ensures that current operation at RTP with a rod misaligned is not resulting in power distributions that may invalidate safety analysis assumptions at full power. The Completion Time of 8 hours allows sufficient time to obtain flux maps of the core power distribution using the incore flux mapping system and to calculate $F_Q(Z)$ and $F_{\Delta H}^N$.

BASES

ACTIONS

B.2.1.1, B.2.1.2, B.2.2, B.3, and B.4 (continued)

In lieu of determining hot channel factors ($F_Q(Z)$ and F_{AH}^N) within the Completion Time of 8 hours, reducing the high neutron flux trip setpoint to 85% RTP ensures that local LHR increases due to a misaligned RCCA will not cause the core design criteria to be exceeded. The Completion Time of 8 hours gives the operator sufficient time to accomplish an orderly power reduction and setpoint change without challenging the Reactor Protection System.

When a rod is known to be misaligned, there is a potential to impact the SDM. Since the core conditions can change with time, periodic verification of SDM is required. A Frequency of 12 hours is sufficient to ensure this requirement continues to be met.

Once current conditions have been verified acceptable, time is available to perform evaluations of accident analyses to determine that core limits will not be exceeded during a Design Basis Event for the duration of operation under these conditions. The accident analyses presented in Ref. 3 that may be adversely affected will be evaluated to ensure that the analysis results remain valid for the duration of continued operation under these conditions.

If the analyses do not support continued operation at RTP, then the power must be reduced to a level consistent with the safety analyses.

A Completion Time of 30 days is sufficient time to obtain the required input data and to perform the analysis and adjust power level.

BASES

ACTIONS
(continued)

C.1

When Required Actions cannot be completed within their Completion Time, the unit must be brought to a MODE or Condition in which the LCO requirements are not applicable. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours, which eliminates concerns about the development of undesirable xenon or power distributions. The allowed Completion Time of 6 hours is reasonable, based on operating experience, for reaching MODE 3 from full power conditions in an orderly manner and without challenging the plant systems.

D.1.1 and D.1.2

More than one control rod becoming misaligned from its group average position is not expected, and has the potential to reduce SDM. Therefore, SDM must be evaluated. One hour allows the operator adequate time to determine SDM. Restoration of the required SDM, if necessary, requires increasing the RCS boron concentration to provide negative reactivity, as described in the Bases for LCO 3.1.1. The required Completion Time of 1 hour for initiating boration is reasonable, based on the time required for potential xenon redistribution, the low probability of an accident occurring, and the steps required to complete the action. This allows the operator sufficient time to align the required valves and initiate boration. Boration will continue until the required SDM is restored.

BASES

ACTIONS
(continued)

D.2

If more than one rod is found to be misaligned or becomes misaligned because of bank movement, the unit conditions fall outside of the accident analysis assumptions. The unit must be brought to a MODE or Condition in which the LCO requirements are not applicable. To achieve this status, the unit must be brought to at least MODE 3 within 6 hours.

The allowed Completion Time is reasonable, based on operating experience, for reaching MODE 3 from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE
REQUIREMENTS

SR 3.1.4.1

Verification that individual rod positions are within alignment limits at a Frequency of 12 hours provides a history that allows the operator to detect a rod that is beginning to deviate from its expected position. The specified Frequency takes into account other rod position information that is continuously available to the operator in the control room, so that during actual rod motion, deviations can immediately be detected.

SR 3.1.4.1 is modified by a Note which direct the operators to Specification 3.1.7, "Rod Position Indication," if a rod appears to be misaligned by more than 12 steps. If the rod position indication is determined to be correct in accordance with Specification 3.1.7, then the operator must return to Specification 3.1.4 and enter the appropriate Conditions for rod misalignment.

BASES

SURVEILLANCE
REQUIREMENTS
(continued)

SR 3.1.4.2

Verifying each control rod is OPERABLE would require that each rod be tripped. However, in MODES 1 and 2, tripping each control rod would result in radial or axial power tilts, or oscillations. Exercising each individual control rod every 92 days provides increased confidence that all rods continue to be OPERABLE without exceeding the alignment limit, even if they are not regularly tripped. Moving each control rod by ≥ 10 steps will not cause radial or axial power tilts, or oscillations, to occur providing rod alignment limits are not exceeded. The 92 day Frequency takes into consideration other information available to the operator in the control room and SR 3.1.4.1, which is performed more frequently and adds to the determination of OPERABILITY of the rods. Between required performances of SR 3.1.4.2 (determination of control rod OPERABILITY by movement), if a control rod(s) is discovered to be immovable, but remains trippable, the control rod(s) is considered to be OPERABLE. At any time, if a control rod(s) is immovable, a determination of the trippability (OPERABILITY) of the control rod(s) must be made, and appropriate action taken.

SR 3.1.4.3

Verification of rod drop times allows the operator to determine that the maximum rod drop time permitted is consistent with the assumed rod drop time used in the safety analysis. Measuring rod drop times prior to reactor criticality, after reactor vessel head removal, ensures that the reactor internals and rod drive mechanism will not interfere with rod motion or rod drop time, and that no degradation in these systems has occurred that would adversely affect control rod motion or drop time. This testing is performed with all RCPs operating and

BASES

SURVEILLANCE
REQUIREMENTS
(continued)

SR 3.1.4..3

the average moderator temperature $\geq 500^{\circ}\text{F}$ to simulate a reactor trip under actual conditions. Actual rod drop time is measured from opening of the reactor trip breaker (RTB) which is conservative with respect to beginning of decay of stationary gripper coil voltage.

This Surveillance is performed during a plant outage, due to the plant conditions needed to perform the SR and the potential for an unplanned plant transient if the Surveillance were performed with the reactor at power.

REFERENCES

1. AEC "General Design Criteria for Nuclear Power Plant Construction Permits" Criteria 6, 14, 27, and 28, issued for comment July 10, 1967, as referenced in USAR Section 1.2.
 2. 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water Nuclear Power Plants".
 3. USAR, Section 14.4.
-

BASES

LCO (continued)

The 12 step agreement limit between bank demand position indication and the RPI System when the demand position is between 30 and 215 steps indicates that the bank demand position indication is adequately calibrated, and can be used for indication of the measurement of control rod bank position.

A deviation of less than the allowable limit, given above, in position indication for a single control rod, ensures high confidence that the position uncertainty of the corresponding control rod group is within the assumed values used in the analysis (that specified control rod group insertion limits).

These requirements ensure that control rod position indication during power operation and PHYSICS TESTS is accurate, and that design assumptions are not challenged.

OPERABILITY of the position indicator channels ensures that inoperable, misaligned, or mispositioned control rods can be detected. Therefore, power peaking, ejected rod worth, and SDM can be controlled within acceptable limits.

This LCO is modified by 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. 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.

In accordance with this Note, the comparison of bank demand position and RPI may take place at any time up to one hour after rod motion, at any power level. Based on this allowance, position indication may be considered OPERABLE during the thermal soak time to allow position indication to stabilize.

BASES (continued)

APPLICABILITY The requirements on the RPI and step counters are only applicable in MODES 1 and 2 (consistent with LCO 3.1.4, LCO 3.1.5, and LCO 3.1.6), because these are the only MODES in which power is generated, and the OPERABILITY and alignment of rods have the potential to affect the safety of the plant. In the shutdown MODES, the OPERABILITY of the shutdown and control banks has the potential to affect the required SDM, but this effect can be compensated for by an increase in the boron concentration of the Reactor Coolant System. See LCO 3.1.1, "SHUTDOWN MARGIN (SDM)," for SDM requirements in MODE 2 with $k_{\text{eff}} < 1.0$ and MODES 3, 4, and 5 and LCO 3.9.1, "Boron Concentration," for boron concentration requirements during MODE 6.

ACTIONS The ACTIONS table is modified by a Note indicating that a separate Condition entry is allowed for each inoperable RPI and each demand position indicator. This is acceptable because the Required Actions for each Condition provide appropriate compensatory actions for each inoperable position indicator.

A.1

When one RPI channel per group fails, the position of the rod may still be determined indirectly by use of the moveable incore detectors. Based on experience, normal power operation does not require excessive movement of banks. 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. Verification may determine that the RPI is OPERABLE and the rod is misaligned, then the Conditions of LCO 3.1.4, "Rod Group Alignment Limits" must be entered.

BASES

ACTIONS (continued)

A.2

Reduction of THERMAL POWER to $\leq 50\%$ RTP puts the core into a condition where rod position is not significantly affecting core peaking factors.

The allowed Completion Time of 8 hours is reasonable, based on operating experience, for reducing power to $\leq 50\%$ RTP from full power conditions without challenging plant systems and allowing for rod position determination by Required Action A.1 above.

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

When more than one RPI channel per group fails, additional monitoring shall be performed to assure that the reactor remains in a safe condition. The demand position from the group step counters associated with the rods with inoperable position indicators shall be monitored and recorded on an hourly basis. This ensures a periodic assessment of rod position to determine if rod movement in excess of 24 steps has occurred since the last determination of rod position. If rod movement in excess of 24 steps has occurred since the last determination of rod position, the Required Action of B.3 is required.

The reactor coolant system average temperature shall be monitored and recorded on an hourly basis. Monitoring and recording of the reactor coolant system average temperature may provide early detection of mispositioned or dropped rods.

When one or more rods have been moved in excess of 24 steps in one direction, since the position was last determined, action is initiated sooner to begin verifying that these rods are still properly positioned relative to their group positions. The 4 hour allowance for completion of this action allows adequate time to complete the rod position verification using the moveable incore detectors.

BASES

ACTIONS

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

The position of rods with inoperable RPIs will also continue to be verified indirectly using the moveable incore detectors every 8 hours in accordance with Required Action A.1. Using the moveable incore detectors provides further assurance that the rods have not moved.

Based on experience, normal power operation does not require excessive movement of banks. Therefore, the actions specified in this condition are adequate for continued full plant operation for up to 24 hours 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 allowed out of service time also provides sufficient time to troubleshoot and restore the RPI System to operation following a component failure in the system, while avoiding the challenges associated with a plant shutdown.

C.1.1 and C.1.2

Demand position indication is provided by any of the following means: step counters; ERCS; calculations using rod drive cabinet counters and Pulse to Analog counters. With all indication for one demand position per bank inoperable, the rod positions can be determined by the RPI System. Since normal power operation does not require excessive movement of rods, verification by administrative means that the rod position indicators are OPERABLE and the rod position indication of the most withdrawn rod and the rod position indication of the least withdrawn rod are ≤ 12 steps apart within the allowed Completion Time of once every 8 hours is adequate. This ensures that the most withdrawn and least withdrawn rod are no more than 24 steps apart (including instrument uncertainty) which bounds the accident analysis assumptions. This verification can be an examination of logs, administrative controls, or other information that shows that all RPIs in the affected bank are OPERABLE.

BASES

ACTIONS (continued)

C.2

Reduction of THERMAL POWER to $\leq 50\%$ RTP puts the core into a condition where rod position is not significantly affecting core peaking factor limits. The allowed Completion Time of 8 hours provides an acceptable period of time to verify the rod positions per Required Actions C.1.1 and C.1.2 or reduce power to $\leq 50\%$ RTP.

D.1

If the Required Actions cannot be completed within the associated Completion Time, the plant must be brought to a MODE in which the requirement does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours. The allowed Completion Time is reasonable, based on operating experience, for reaching the required MODE from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.1.7.1

Verification that the RPI agrees with the demand position within 12 steps (between 30 and 215 steps) or within 24 steps (when ≤ 30 steps or ≥ 215 steps) ensures that the RPI is operating correctly.

This Surveillance is performed prior to reactor criticality after each removal of the reactor head as there is the potential for unnecessary plant transients if the SR were performed with the reactor at power.

REFERENCES

1. AEC "General Design Criteria for Nuclear Power Plant Construction Permits" Criteria 12 and 13, issued for comment July 10, 1967, as referenced in USAR Section 1.2.
2. USAR, Sections 14.4 and 14.5.