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LIC-10-0034
July 12, 2010

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

REFERENCES: Docket No. 50-285

SUBJECT: Fort Calhoun Station, Unit No. 1, License Amendment Request (LAR) "Revision to Technical Specification (TS) 2.15, Table 2-5, Item 1 and TS 3.1, Table 3-3, Items 1, 2 and 4 Control Element Assembly Position Indication and Correction of TS 2.10.2(7)c"

Pursuant to 10 CFR 50.90, the Omaha Public Power District (OPPD) hereby requests revisions to Technical Specification (TS) 2.15, Table 2-5, Item 1 and TS 3.1, Table 3-3, Items 1 and 2, which pertain to operability of the primary and secondary control element assembly (CEA) position indication system (CEAPIS) channels. A new surveillance requirement (SR) is proposed for TS 3.1, Table 3-3, Item 4, which will verify the position of CEAs each shift.

When a CEAPIS channel is inoperable, more frequent verification of CEA positions following any CEA movement as required by the proposed change to TS 2.15, Table 2-5, Item 1 will ensure that CEA alignment is maintained. An unnecessarily specific surveillance method in TS 3.1, Table 3-3 is replaced with the defined term "CHANNEL CHECK," which will allow an additional means (i.e., distributed control system (DCS) core mimic indication) of verifying CEA positions when the CEAs are either fully inserted or fully withdrawn. Each shift, the new SR proposed for TS 3.1, Table 3-3, Item 4 will require that the position of each CEA is verified to be within 12 inches of all other CEAs in its group as required by TS 2.10.2(4).

The proposed amendment will ensure that CEA alignment is maintained during power operations so that the power distribution and reactivity limits defined by the design power peaking and shutdown margin (SDM) limits are preserved. Associated TS Basis changes supporting the revisions to TS 2.15 and TS 3.1 are provided for information only.

A change is also proposed for TS 2.10.2(7)c. Currently, TS 2.10.2(7)c requires actions to be taken to restore the regulating CEA groups to within the Long Term Insertion Limit only if both time intervals are exceeded. The proposed change will make TS 2.10.2(7)c more consistent with Combustion Engineering (CE) Standard Technical Specifications (STS) and will require actions to be taken if either time interval is exceeded.

OPPD requests approval of the proposed amendment by July 1, 2011. Once approved, the amendment shall be implemented within 180 days.

No commitments to the NRC are made in this letter.

If you should have any questions regarding this submittal or require additional information, please contact Mr. Bill R. Hansher at (402) 533-6894.

I declare under penalty of perjury that the foregoing is true and correct. Executed on July 12, 2010.

Jeffrey A. Reinhart
Site Vice President

Enclosure: OPPD's Evaluation of the Proposed Changes

c: Director of Consumer Health Services, Department of Regulation and Licensure, Nebraska Health and Human Services, State of Nebraska

OPPD's Evaluation of the Proposed Changes

Revision to Technical Specification (TS) 2.15, Table 2-5, Item 1 and TS 3.1, Table 3-3, Items 1, 2 and 4, Control Element Assembly Position Indication and Correction of TS 2.10.2(7)c

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ATTACHMENTS:

1. Technical Specification and Bases Page Markups
2. Retyped ("Clean") Technical Specification and Bases Pages

1.0 SUMMARY DESCRIPTION

This letter is a request to amend Renewed Operating License DPR-40 for Fort Calhoun Station (FCS), Unit No. 1.

The Omaha Public Power District (OPPD) proposes to revise Technical Specification (TS) 2.15, Table 2-5, Item 1 and TS 3.1, Table 3-3, Items 1 and 2, which pertain to operability of the primary and secondary control element assembly (CEA) position indication systems (CEAPIS). A new surveillance requirement (SR) is proposed for TS 3.1, Table 3-3, Item 4. The proposed amendment ensures maintenance of CEA alignment but allows continued operation with one CEAPIS channel inoperable by requiring more frequent verification of CEA positions following any CEA movement. The proposed amendment minimizes the potential for an unplanned shutdown. Associated TS Basis changes supporting the revisions to TS 2.15 and TS 3.1 are provided for information only.

In addition, a change is proposed for TS 2.10.2(7)c regarding actions to be taken when the regulating CEA groups are inserted below the Long Term Insertion Limit. The TS is currently worded such that both time intervals must be exceeded before actions are required. The TS is revised to require actions to be taken when either time interval is exceeded, which will make TS 2.10.2(7)c more consistent with Combustion Engineering (CE) Standard Technical Specifications (STS). (Reference 6.1)

2.0 DETAILED DESCRIPTION

The proposed amendment is similar to the TS requirements for the Palisades Plant, specifically limiting conditions of operation (LCO) 3.1.4, "Control Rod Alignment," Action A and associated surveillance requirements (SR) 3.1.4.1 and 3.1.4.2. Like Palisades, FCS is a CE Analog plant of similar vintage and has similar CEA (control rod) position indication systems. Updated Safety Analysis Report (USAR) Section 1.9 (Reference 6.2) compares FCS against the Palisades Plant and several other pressurized water reactors. It should be noted that the information contained in USAR Section 1.9 is historical in nature as all of the plants discussed including FCS have since undergone multiple changes.

The design of FCS is based upon concepts that were developed and successfully applied in the construction of pressurized water reactor systems or that were demonstrated through extensive testing. The FCS reactor design evolved from the Palisades design effort, and is distinguished by the control rod shape and configuration. The control rod, designated in the FCS reactor as a control element assembly, consists of five Inconel tubes containing boron carbide as the poison material. The tubes are joined by a spider at the upper end, and the hub of the spider also couples the CEA to the drive mechanism rack through the drive shaft extension.

Hereafter, the terms control element assembly (CEA) and control element drive mechanism (CEDM), are considered synonymous with control rod and control rod drive mechanism (CRDM), respectively.

TS 2.15, Table 2-5, Item 1 is the minimum number of CEAPIS channels required to be operable. Note e is proposed for Item 1, which will be applicable when either the primary CEAPIS channel or the secondary CEAPIS channel is inoperable for one or more CEAs. Note e will modify the requirements of TS 2.15 to require the performance of a new SR (TS 3.1, Table 3-3, Item 4) within 15 minutes following any CEA motion in that group. Note e also clarifies that TS 2.15(1), (2), and (3) are not applicable to CEAPIS channels as explained in Section 3.0 below.

TS 3.1, Table 3-3, Item 4, will verify that the position of each CEA is within 12 inches of all other CEAs in its group each shift to ensure the alignment required by TS 2.10.2(4) is maintained. TS 3.1, Table 3-3, Items 1.a and 2.a are revised to eliminate the requirement for a check of primary CEAPIS data with secondary CEAPIS data and vice versa each shift and will instead require the performance of a CHANNEL CHECK.

The Basis of TS 2.15 and the Basis of TS 3.1 are revised to remove a restriction on use of the distributed control system (DCS) core mimic (i.e., limit switch indication) as a means of verifying the position of CEAs when they are either fully inserted or fully withdrawn. The restriction introduced previously by a Technical Specification Bases Change (TSBC) was intended to clarify that the SRs of TS 3.1, Table 3-3, Items 1.a and 2.a do not currently allow DCS core mimic to serve as an alternative to data from primary or secondary CEAPIS. With the proposed change to TS 3.1, Table 3-3, Items 1.a and 2.a, this restriction will no longer be necessary. DCS core mimic is diverse from the primary and secondary CEAPIS channels and provides accurate and reliable CEA position information when the CEAs are either fully inserted or fully withdrawn. Changes to the Basis of TS 2.15 and TS 3.1 are provided for information only.

TS 2.10.2(7)c is revised to state that when the regulating CEA groups are inserted below the Long Term Insertion Limit for in excess of 4 EFPD per 30 EFPD interval <u>or</u> in excess of 14 EFPD per fuel cycle, certain actions must be taken. The “and” that currently links these two time intervals implies that actions are required only if both time intervals are exceeded. This change will make TS 2.10.2(7)c more consistent with LCO 3.1.6, “Regulating Control Element Assembly (CEA) Insertion Limits (Analog),” Action C of CE STS. (Reference 6.1)

3.0 TECHNICAL EVALUATION

Background

Limits on shutdown and regulating CEA alignments ensure that assumptions in the safety analysis remain valid. CEA operability requirements ensure that upon reactor trip, the CEAs can be inserted to provide enough negative reactivity to shut down the reactor. CEA operability requirements (i.e., trippability) are separate from alignment requirements, which ensure that the CEA banks maintain the correct power distribution and CEA alignment. The CEA operability requirement is satisfied provided the CEA will fully insert in the drop time assumed in the safety analysis. CEA control malfunctions that result in the inability to move a CEA (e.g., CEA lift rod failures), but that do not affect trippability, do not result in CEA inoperability. Failure to meet CEA alignment requirements may produce unacceptable power peaking factors and linear heat rates (LHR), or unacceptable shutdown margin (SDM), all of which may constitute initial conditions inconsistent with the safety analysis.

Limits on CEA alignment and operability have been established, and all CEA positions are monitored and controlled during power operation to ensure that the power distribution and reactivity limits defined by the design power peaking and SDM limits are preserved. The CEAs are arranged into groups that are radially symmetric. Therefore, movement of the CEAs does not introduce radial asymmetries in the core power distribution. The shutdown and regulating CEAs provide the required reactivity worth for immediate reactor shutdown upon a reactor trip. The regulating CEAs also provide reactivity (power level) control during normal operation and transients.

Design Bases

Reactivity and Control Requirements

Reactivity control is accomplished by adjusting both the position of the CEAs and the concentration of boric acid in the reactor coolant system (RCS). The CEAs permit rapid changes in reactivity, as required for reactor trip and to compensate for changes in moderator temperature, fuel temperature, and void formation associated with changes in power level. There are 45 standard and 4 full length non-trippable CEAs. The standard CEAs are used for shutdown and for regulation. The CEAs designated as shutdown CEAs are divided into 2 separately controlled groups; those designated as regulating CEAs are divided into 4 groups. During power operation, the shutdown groups are fully withdrawn while the position of the regulating groups is adjusted to meet reactivity and power distribution requirements. All CEAs except the full length non-trippable CEAs drop to a fully inserted position upon reactor trip. (Reference 6.3)

Adjustment of boric acid concentration controls the relatively slow reactivity changes associated with plant heatup and cooldown, fuel burnup, and certain xenon variations. Boric acid dissolved in the reactor coolant makes it possible to maintain the CEAs in a withdrawn position during full power operation, thus minimizing distortions in power distribution. During refueling, additional boric acid is used to provide a large shutdown margin to maintain the core subcritical. USAR Section 3.4.1, Table 3.4-3 lists the concentrations of natural boron required to maintain the core critical under various conditions, assuming all CEAs are fully withdrawn. (Reference 6.3)

The refueling boron concentration (without considering the worth of the CEAs) provides a reactivity shutdown of approximately 5 percent for the cold condition. The refueling concentration is specified as an equivalent ppm boric acid (H_3BO_3) in the coolant in the Core Operating Limits Report (COLR), which is approximately 10 percent of the solubility limit at refueling temperatures. After a normal shutdown or reactor trip, boric acid may be injected into the RCS to compensate for reactivity increases due to normal cooldown and xenon decay. Although the boric acid system reduces reactivity relatively slowly, the rate of reduction is more than sufficient to maintain the shutdown margin against the effects of normal cooldown and xenon decay.

Sufficient worth is available in the regulating CEAs to compensate for the rapid changes in reactivity associated with power level changes. In addition, these CEAs may be used for partial control of xenon transients and minor variations in moderator temperature and boron concentration. USAR Section 3.4.1, Table 3.4-4 summarizes the hot zero power control rod worths at both beginning and end-of-cycle. The reactivity variations are described in USAR Sections 3.4.1.1 through 3.4.1.6. The worth of all CEAs, including shutdown CEAs, covers the reactivity variations and provides adequate shutdown with the most reactive CEA stuck in the fully withdrawn position. Margin is provided between the calculated CEA worth and the reactivity variations to account for uncertainties in the calculations. Only the 45 full length trippable CEAs are considered in Table 3.4-4. (Reference 6.3)

USAR Section 3.4.5.1, “Malpositioned CEA’s” evaluates the two worst cases of a malpositioned CEA with respect to permissible operating modes and current administrative guidelines. These cases are:

a. The worst case of a CEA left in the core and

b. Insertion of the CEA bank permissible at full power with one CEA left out.

Worst Case of a CEA Left in the Core

Startup or operation with the most reactive CEA left in the core would result in a large distortion in the radial power distribution and consequently excessive peaking. It is not necessary to analyze this event, because the rod block system prevents its occurrence. The system prevents rod group motion with one CEA deviating from the group's position by more than 12 inches. Group motion will stop before the 12 inch deviation limit is reached, which prevents leaving one CEA in with the rest of its group withdrawn. This limit is referenced in TS 2.10.2(4) and a new SR (TS 3.1, Table 3-3, Item 4) is proposed that will verify that all CEAs are within the 12 inch limit. In addition, the CEA position indication system provides alarms from the synchros for deviations of 4 and 8 inches.

If a CEA was uncoupled from the rack and pinion drive system (which could occur after refueling), rack movement alone might not indicate a deviation. Therefore, the coupled and uncoupled weight is measured. The difference between the coupled and uncoupled weight is 55 pounds for a single CEA and 110 pounds for a dual CEA. The test is administratively controlled and ensures that the CEAs are properly coupled. Even if a CEA was totally inserted with all others withdrawn, the inserted CEA would be detected by the incore monitoring system which would cause alarms due to excessive flux peaking in detector locations across the core from the rodded and depressed neutron flux area. A detectable change in flux tilt would also be detected by both the incore and excore detector systems.

Insertion of the CEA Bank Permissible at Full Power with One CEA Left Out

The rod block circuitry prevents insertion of Regulating Group 4 with one of the CEAs left out. As in the case of leaving one CEA inserted, group motion will automatically be stopped and prevented prior to the rod-group deviation exceeding 12 inches. In addition, deviation alarms at 4 and 8 inches provide warning of the asymmetry. Therefore, as the rod block circuitry prevents this condition, no further analysis is required.

FCS CEA Position Indication System

FCS is a CE Analog plant similar to the Palisades Plant. The FCS reactor contains 37 CEDMs, not including the 4 CEDMS that are spares. The CEDMs move the CEAs within the reactor core. The speed at which the CEA is inserted or withdrawn from the core is consistent with the reactivity change required during reactor operation. For conditions that require a rapid shutdown of the reactor, the CEDM drive releases to allow the CEA and the supporting CEDM components to drop into the core by gravity. The reactivity is reduced during such a drop at a rate sufficient to control the core under any operating transient or accident condition. CEA speed is a direct function of drive motor power supply frequency, which is limited by the transmission frequency control system to 60 cycles per second. Thus, CEA speed limiting features are not provided as they are unnecessary. The CEA is decelerated at the end of the drop by the CEDM, which supports the CEA in the fully inserted position. (Reference 6.4)

Each of the 37 CEDMs are equipped with 2 separate and independent position indication systems known as the primary and secondary CEA position indication systems, which provide the operator with position information.

There are three means of determining the position of CEAs:

1. The primary CEAPIS, which utilizes the output of a synchro transmitter geared to the clutch output shaft.
2. The secondary CEAPIS, which utilizes the output of a voltage divider network controlled by a series of reed switches.
3. CEA full-in and full-out indication, which is provided by limit switches on the regulating CEAs and from dedicated reed switches on the shutdown CEAs.

Primary CEAPIS Channel

The primary CEAPIS channel utilizes the output of a synchro transmitter geared to the drive shaft of the control element drive mechanism. When the sending unit rotor is moved, the current shift moves the receiver unit a corresponding amount. CEA position, accurate to within ± 0.5 inches is supplied to the plant computer for indication and control. Synchro indication is also provided to the secondary CEAPIS DCS. (Reference 6.5)

CEA position is displayed visually at the main control panel. There are 7 receiver unit gauges on control board panel CB-4, which indicate 128 inches of CEA travel and are dedicated to their respective CEA control group: A, B, 1, 2, 3, 4, and N. A selector switch at each display allows the position of any CEA in the group to be shown. Should any CEA in the group deviate in position more than a preset amount (i.e., 4 and 8 inches) from any other in the group, a deviation alarm alerts the operator. The out-of-limits CEA can also be identified on the secondary CEA position indication system's flat-panel touch monitors. The position of all CEAs may be displayed or printed by the plant computer at any time. Rod drop timing is also performed using the primary CEA position indication system. (Reference 6.5) CEA position information is also used to initiate alarms when limiting conditions are approached, to provide contact closures for sequencing and control, and to monitor for an alarm position deviation between individual CEAs within a group. During a drop test, the plant computer measures and records the time for a CEA to reach the 90 percent inserted position after the clutch is released. (Reference 6.5)

Secondary CEAPIS Channel

The secondary CEAPIS channel measures CEA position by use of magnetic reed switches actuated by a permanent magnet attached to the rack assembly; 64 reed switches in a 128-inch string are provided for each CEDM. An assembly containing a number of series resistors to form a voltage divider network with reed switches connected at each junction is attached to the CEA extension housing. A voltage is applied to the network; output voltage depends on which reed switches are closed in the voltage divider. A magnet on top of the CEA extension actuates the reed switches as the CEA moves. Overlap between adjacent reed switches is provided. The output is a voltage directly proportional to CEA position. (Reference 6.5)

A Foxboro I/A DCS controls all input and output. There are 3 workstations operators typically use to retrieve the information where it is displayed on flat-panel touch monitors. When the uppermost reed switch is closed, full power is provided to the DCS bypassing the resistors below it. If the bottom reed switch is closed, minimum voltage is provided to the DCS. The output from all assemblies is sent to the DCS flat-panel touch monitors, which are independent of the primary CEA position visual displays. Simultaneous visual display of all CEA groups is provided on the DCS flat-panel touch monitors and individual CEA position is provided when a CEA group display is selected by the operator. (Reference 6.5)

The secondary CEA position indication system is mechanically and electrically isolated from the primary CEA position indication system. The DCS receives input from the synchro sensors through the Data Acquisition System and displays the data on the DCS flat-panel touch monitors. The resolution of the secondary CEA position indication system is approximately ± 2 inches. (Reference 6.5)

The secondary CEA position indication system monitors CEA position and reactor power and initiates alarms when abnormal CEA configurations are detected. The secondary CEA position indication system also initiates the actuation of the rod (CEA) block system to inhibit all CEA motion in the event an LCO on CEA insertion, CEA deviation, CEA overlap or CEA sequencing is approached. (Reference 6.5)

DCS Core Mimic

Prior to 2008, FCS had control rod "full-in" and "full-out" lights corresponding to the lower electrical limit and the upper electrical limit, respectively, which could determine control rod positions when the control rods were at either their fully inserted or fully withdrawn positions. However, the SRs of TS 3.1, Table 3-3, Items 1.a and 2.a being unnecessarily specific, did not allow use of these lights as a valid comparison with primary or secondary CEAPIS data.

CEA full-in and full-out indication from limit switches on the regulating CEAs and reed switches on the shutdown CEAs is now displayed on the DCS flat-panel touch monitors, which were installed during the 2008 refueling outage. Although the primary input is from the limit switches, this system known as DCS core mimic also has an interface with secondary CEAPIS, which enhances the reliability of DCS core mimic indication. Secondary CEAPIS provides CEA position indication to the DCS core mimic from the synchros and the reed switches. This is compared to a position setpoint and used to validate limit switch input against the actual CEA position as obtained from the synchros/reed switches. If the validation passes, limit switch position is indicated on the flat-panel touch monitors. If the validation fails, limit switch position is not provided and an alarm is generated to indicate a potential limit switch failure. If the validation failure is the result of a malfunction in primary and/or secondary CEAPIS, then automatic or manual actions are taken to restore mimic functionality using only the limit switches as inputs. (Reference 6.5)

Proposed Revision to TS 2.15, Table 2-5

Note e proposed for TS 2.15, Table 2-5, Item 1 will be applicable when either the primary CEAPIS channel or the secondary CEAPIS channel is inoperable for one or more CEAs. Currently, with only 2 channels, when 1 is inoperable, the minimum operable channels limit of TS 2.15, Table 2-5, Item 1 is reached and the LCO of TS 2.15(2) is entered. Although TS 2.15(1) also applies when a particular system falls 1 below the number of installed channels, it is primarily intended for application to the 4-channel functional units of the reactor protective system (RPS), engineered safety feature (ESF) system, and isolation system. The loss of a single channel for a 4-channel functional unit of RPS, ESF or an isolation system does not place it at minimum operable channel limits as it does for the 2-channel CEA position indication system.

However, although conservative, it is less than ideal to apply TS 2.15(2) to an inoperable CEAPIS channel because CEAPIS channels are not designed to be placed in the trip or bypass position as required by TS 2.15(2). (TS 2.15(3) is applicable to ESF or isolation logic subsystems, and TS 2.15(5) is applicable to the alternate shutdown panel and auxiliary feedwater panel instrumentation or control circuits and thus neither LCO is applicable to CEAPIS.)

Note e will modify the requirements of TS 2.15 when one CEAPIS channel is inoperable to require the performance of a new CEA position verification SR (TS 3.1, Table 3-3, Item 4) within 15 minutes following any CEA motion in that group. CEAs are most likely to become misaligned during movement. This change will ensure that deviations are promptly detected and corrected to preserve power distribution and reactivity limits. For the reasons stated above, Note e clarifies that TS 2.15(1), (2), and (3) are not applicable to CEAPIS channels.

The proposed revision does not alter the requirements of TS 2.15(4) regarding the rod block function of the secondary CEAPIS channel. If the secondary CEAPIS channel or its rod block function is inoperable, TS 2.15(4) must be entered to address the possibility of several additional CEA deviation events. TS 2.15(4) requires the CEAs to be maintained fully withdrawn with the control rod drive system mode switch in the off position except when manual motion of CEA Group 4 is required to control axial power distribution.

In this situation, the proposed revision to TS 3.1, Table 3-3, Items 1 and 2 would allow DCS core mimic to be used to perform the channel check of primary CEAPIS each shift while secondary CEAPIS was repaired. In the event that DCS core mimic was unavailable (e.g., should it be necessary to insert CEA Group 4 for control of axial power distribution); the primary CEAPIS would be declared inoperable when the CHANNEL CHECK could not be performed. This would place FCS below the minimum operable channel limits of TS 2.15, Table 2-5, Item 1, requiring FCS to be in hot shutdown within 12 hours in accordance with TS 2.15(4). Thus, other than allowing DCS core mimic to be used to conduct the CHANNEL CHECK of primary CEAPIS, there is no impact on required actions if the rod block function or secondary CEAPIS is inoperable.

Proposed Revision to TS 3.1, Table 3-3

TS 3.1, Table 3-3, Item 4 requires verification each shift (unless invoked at a more frequent interval by TS 2.15, Table 2-5, Note e) that CEAs are positioned within 12 inches of all other CEAs in the group. This is consistent with the requirements of TS 2.10.2(4), which requires all full length (shutdown and regulating) CEAs to be positioned within 12 inches of all other CEAs in the group.

The proposed revision to TS 3.1, Table 3-3, Items 1.a and 2.a, eliminates the requirement for a check of primary CEAPIS data with secondary CEAPIS data and vice versa each shift and will instead require the performance of a CHANNEL CHECK. The FCS Technical Specifications define a CHANNEL CHECK as "A qualitative determination of acceptable operability by observation of channel behavior during normal plant operation. This determination shall where feasible, include comparison of the channel with other independent channels measuring the same variable." A CHANNEL CHECK is appropriate as the requirements are very similar to the surveillance methods proposed for deletion yet the definition provides sufficient flexibility to allow use of another means of verifying CEA positions such as DCS core mimic.

In contrast for example, currently, if primary CEAPIS cannot be verified by secondary CEAPIS during a 12-hour shift, the primary CEAPIS channel is declared inoperable. Shortly thereafter, both CEAPIS channels would be declared inoperable when secondary CEAPIS data could not be verified by primary CEAPIS. TS 2.15(4) would be entered, which requires the plant to be placed in hot shutdown within 12 hours.

A "CHANNEL CHECK" is preferable to the current surveillance methods of TS 3.1, Table 3-3, Items 1.a and 2.a. When DCS core mimic is available, (i.e., when the CEAs are either fully inserted or fully withdrawn), the definition of CHANNEL CHECK will require that primary and secondary CEAPIS channels be compared to it as well as each other. Should either primary or secondary CEAPIS become inoperable, the OPERABLE channel can be compared to DCS core mimic with enough confidence to allow continued plant operation. DCS core mimic indication is tested each refueling outage per procedure OP-ST-CEA-0006 (Reference 6.6), and the requirements of a CHANNEL CHECK each shift will continue to verify the accuracy of its data through comparison with the primary and secondary CEAPIS channels.

The proposed amendment will still require the plant to be placed in hot shut down in accordance with TS 2.15(4) if a CEAPIS channel is inoperable when a CHANNEL CHECK is required and DCS core mimic is unavailable. The proposed amendment helps minimize the potential for unplanned shutdowns yet still ensures that power distribution and reactivity limits are maintained by requiring two independent means of verifying the position of CEAs where feasible. Monthly tests and refueling interval calibrations of the primary and secondary CEA position indication system channels are unchanged and will continue to ensure that each channel is operable.

Proposed Revision to TS 2.10.2(7)c

The change proposed for TS 2.10.2(7)c incorporates more conservative wording to ensure that the regulating CEA groups are maintained within the Long Term Insertion Limit. The "and" that currently links these two time intervals implies that actions are required only if both time intervals are exceeded. Replacing "and" with "or in excess of" ensures that corrective actions are taken if either time interval is exceeded. The proposed change also makes TS 2.10.2(7)c more consistent with LCO 3.1.6, "Regulating Control Element Assembly (CEA) Insertion Limits (Analog)," Action C of CE STS. (Reference 6.1)

Conclusion

In conclusion, Note e as proposed for TS 2.15, Table 2-5, Item 1 will modify the requirements of TS 2.15 when one CEAPIS channel is inoperable to instead require the performance of a new CEA position verification SR (TS 3.1, Table 3-3, Item 4) within 15 minutes following any CEA motion in that group. As CEAs are most likely to become misaligned during movement, this change ensures that deviations are promptly detected and corrected. Note e also clarifies that TS 2.15(1), (2), and (3) are not applicable to CEAPIS channels.

TS 3.1, Table 3-3, Item 4 will verify each shift (unless invoked at a more frequent interval by TS 2.15, Table 2-5, Note e) that CEAs are positioned within 12 inches of all other CEAs in the group, which is consistent with the requirements of TS 2.10.2(4).

The proposed revision to TS 3.1, Table 3-3, Items 1.a and 2.a, eliminates the requirement for a check of primary CEAPIS data with secondary CEAPIS data and vice versa each shift and will instead require the performance of a CHANNEL CHECK. A CHANNEL CHECK is preferable as it is very similar to the deleted requirements (i.e., primary CEAPIS will still normally be used to verify secondary CEAPIS and vice versa). However, a CHANNEL CHECK provides sufficient flexibility to allow the use of DCS core mimic indication when primary or secondary CEAPIS is inoperable. The accuracy and reliability of DCS core mimic indication is assured by comparison with primary and secondary CEAPIS each shift.

Changes to the Basis of TS 2.15 and TS 3.1 supporting the proposed amendment are provided for information only. The Basis of TS 2.15 and TS 3.1 are revised to remove a restriction on use of DCS core mimic (i.e., limit and reed switch indication) as a means of verifying the position of CEAs when they are either fully inserted or fully withdrawn. The restriction introduced previously by a TSBC was intended to clarify that the SRs of TS 3.1, Table 3-3, Items 1.a and 2.a do not allow DCS core mimic to serve as an alternative to data from primary or secondary CEAPIS. With the change to TS 3.1, Table 3-3, Items 1.a and 2.a, this restriction will no longer be necessary.

The change proposed for TS 2.10.2(7)c is more consistent with CE STS.

The proposed amendment will help minimize the potential for unplanned shutdowns with attendant risks to plant safety yet ensures power distribution and reactivity limits are maintained.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

4.1.1 Regulations

The applicable criteria for these reactivity and power distribution design requirements are 10 CFR 50, Appendix A, GDC 10, “Reactor Design” and GDC 26, “Reactivity Control System Redundancy and Capability,” and 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems for Light Water

Nuclear Power Plants." Fort Calhoun Station (FCS), Unit No. 1 was licensed for construction prior to May 21, 1971, and is committed to the draft General Design Criteria (GDC) published for comment in the Federal Register on July 11, 1967 (32 FR 10213) in lieu of 10 CFR 50, Appendix A. Appendix G of the FCS Updated Safety Analysis Report (USAR) shows that draft GDC 6, 27, 29, and 31 are most applicable to the proposed amendment.

CRITERION 6 - REACTOR CORE DESIGN
The reactor core shall be designed to function throughout its design lifetime without exceeding acceptable fuel damage limits which have been stipulated and justified. The core design together with reliable process and decay heat removal systems, shall provide for this capability under all expected conditions of normal operation with appropriate margins for uncertainties and for transient situations which can be anticipated, including the effects of the loss of power to recirculation pumps, tripping out of a turbine generator set, isolation of the reactor from its primary heat sink, and loss of all off-site power.

This criterion continues to be met. Operability of CEAPIS channels will continue to be verified at the same interval and in essentially the same manner as before. The position of CEAs will be verified even more frequently when a CEAPIS channel is inoperable after CEA movements. As a result the limits on CEA alignment and operability will be maintained and all CEA positions will be monitored and controlled during power operation to ensure that the power distribution and reactivity limits defined by the design power peaking and shutdown margin (SDM) limits are preserved. Thus, fuel damage limits will not be exceeded.

CRITERION 27 - REDUNDANCY OF REACTIVITY CONTROL
At least two independent reactivity control systems, preferably of different principles, shall be provided.

This criterion continues to be met. The proposed amendment does not affect compliance with Criterion 27. FCS will continue to employ two separate methods of reactivity control (1) CEAs and (2) adjustment of RCS boric acid concentration.

CRITERION 29 - REACTIVITY SHUTDOWN CAPABILITY
At least one of the reactivity control systems provided shall be capable of making the core subcritical under any condition (including anticipated operational transients) sufficiently fast to prevent exceeding acceptable fuel damage limits. Shutdown margins greater than the maximum worth of the most effective control rod when fully withdrawn shall be provided.

This criterion continues to be met. The mechanical control system remains capable of making the core subcritical under any condition, including anticipated operational transients, sufficiently fast to prevent fuel damage in excess of acceptable limits. This assumes all CEAs except the one of highest worth are inserted in the core.

CRITERION 31 - REACTIVITY CONTROL SYSTEMS MALFUNCTION
The reactivity control systems shall be capable of sustaining any single malfunction, such as unplanned continuous withdrawal (not ejection) of a control rod, without causing a reactivity transient which could result in exceeding acceptable fuel damage limits.

This criterion continues to be met. There are limits on the maximum rate at which reactivity can be increased by unplanned continuous withdrawal of CEAs. The number of CEAs in the core, the assignment of CEAs into operating groups and the design rate of withdrawal were established to assure fuel integrity in the event of uncontrolled CEA withdrawal. While an inadvertent withdrawal of CEAs is considered unlikely, the reactor protective system is designed to terminate any such transient with an adequate margin to departure from nucleate boiling (DNB). The analysis which supports this is described in USAR Section 14.2. This analysis shows that sufficient protection is provided by the high power level trip, the high pressurizer pressure trip, the thermal margin trip and the steam generator water level trip to prevent the minimum DNB ratio from falling below the DNB correlation limit in the event of continuous withdrawal of CEAs.

4.1.2 Updated Safety Analysis Report (USAR)

The following USAR accident analyses involve malfunctions in CEA positioning. A synopsis of each accident and the effect of the proposed amendment on it are discussed.

CEA WITHDRAWAL INCIDENT (USAR 14.2.1)

The sequential CEA group withdrawal incident is assumed to occur as a result of a failure in the CEDM control system or by operator error. The rod block system, which was installed after Cycle 1, has eliminated the possibility of an out-of-sequence bank withdrawal or a single CEA withdrawal due to a single failure. An uncontrolled or unplanned withdrawal of CEAs results in a positive reactivity addition, which causes the core power, core average heat flux, and RCS temperature and pressure to rise in turn decreasing DNB and LHR margins.

The proposed amendment does not have an adverse impact on this accident. When the secondary CEAPIS channel or its rod block function is inoperable, TS 2.15(4) requires the CEAs to be maintained fully withdrawn with the control rod drive system mode switch in the off position except when manual motion of CEA Group 4 is required to control axial power distribution. The proposed amendment does not alter this requirement. Other than allowing DCS core mimic to be used to conduct the CHANNEL CHECK of primary CEAPIS, there is no impact on TS 2.15(4) required actions if the rod block function or secondary CEAPIS is inoperable.

Channel checks, testing, and calibration of the CEAPIS channels will continue to be performed in a similar manner and frequency as before. An additional SR is added to ensure that each shift, the CEAs are positioned within 12 inches of all other CEAs in the group in accordance with the requirements of TS 2.10.2(4). The position of CEAs will be verified even more frequently when a CEAPIS channel is inoperable after CEA movement. Thus, the proposed amendment will not cause or contribute to a CEA withdrawal incident.

CONTROL ELEMENT ASSEMBLY DROP (USAR 14.4)

The CEA drop accident is defined as the inadvertent release of a CEA causing it to drop into the reactor core. The CEA drive is of the rack and pinion type, with the drive shaft running parallel to and driving the rack through a pinion gear and a set of bevel gears. The drive mechanism is equipped with a mechanical brake, which maintains the position of the CEA. A CEA drop may occur due to either an inadvertent interruption of power to the CEA holding coil (i.e., magnetic clutch) or an electrical or mechanical failure of the mechanical brake in the CEA drive mechanism when the CEAs are being moved.

The proposed amendment does not have an adverse impact on this accident. The proposed amendment pertains to requirements for utilization of CEA position indication system channels to verify the position of CEAs. The proposed amendment cannot cause interruption of power to the CEA holding coil or an electrical or mechanical failure of the mechanical brake in the CEA drive mechanism.

CEA EJECTION ACCIDENT (USAR 14.13)

The CEA ejection accident is defined as a mechanical failure in the form of a complete circumferential rupture of a CEDM housing or nozzle on the reactor vessel head resulting in the ejection of a control rod. The consequence of this mechanical failure is a rapid reactivity insertion which when combined with an adverse power distribution may result in localized fuel damage.

The proposed amendment does not have an adverse impact on this accident. The proposed amendment pertains to requirements for utilization of CEA position indication system channels to verify the position of CEAs. As such, the proposed amendment is not an initiator or contributor to any event that could cause a mechanical failure resulting in the ejection of a CEA.

LOSS OF COOLANT FLOW INCIDENT (USAR 14. 6) AND MAIN STEAM LINE BREAK ACCIDENT (USAR 14.12)

The loss of coolant flow event and the main steam line break accident both assume that the most reactive CEA is stuck in its fully withdrawn position.

A loss of normal coolant flow may result from either a loss of electrical power to one or more of the four reactor coolant pumps or from a mechanical failure, such as shaft seizure of a single pump. The loss of electrical power to one or more reactor coolant pumps is referred to as the loss of coolant flow event while the mechanical failure is called the seized rotor event.

A main steam line break accident involves a large pipe break in the main steam system resulting in rapid depletion of the steam generator inventory causing an increased rate of heat extraction from the primary coolant. The resultant cool down of the primary coolant, in the presence of a negative moderator temperature coefficient will cause an increase in nuclear power prior to a reactor trip and an erosion of shutdown margin after reactor trip.

The proposed amendment does not have an adverse impact on this accident. Channel checks, testing, and calibration of the CEA position indication systems will continue to be performed in a similar manner and frequency as before. An additional SR is added to ensure that each shift, the CEAs are positioned within 12 inches of all other CEAs in the group in accordance with the requirements of TS 2.10.2(4). When a CEAPIS channel is inoperable, the position of CEAs will be verified within 15 minutes following any CEA motion in that group.

The proposed amendment pertains to requirements for utilization of CEA position indication system channels to verify the position of CEAs. As such, the proposed amendment is not an initiator or contributor to any event that could cause or contribute to a CEA becoming stuck in the fully withdrawn position. In any case, there is no adverse impact on either of these accidents as both already assume that the most reactive CEA is stuck in its fully withdrawn position.

MALPOSITIONING OF NON-TRIPPABLE CEAs (USAR 14.5)

For Cycle 1 through Cycle 10, four part length control rods were installed. Prior to Cycle 11, the part length rods were replaced and four non-trippable full length rods were installed. Originally, the part length rods were intended for use in controlling the axial power distribution. However, TS 2.10.2(5) required them to be withdrawn to at least 114 inches when critical and in practice, they were withdrawn to the all rods out (ARO) position.

The use of the non-trippable CEAs for axial power distribution has since been prohibited, because movement from a high reactivity region, in which their residence time has been long enough to allow xenon decay, could cause the addition of positive reactivity and distortion of the axial and radial power distributions. The inadvertent insertion of the non-trippable group from the withdrawn condition is still possible.

The proposed amendment does not have an adverse impact on this event. CEAPIS channels will continue to report the position of the non-trippable CEAs. Channel checks, testing, and calibration of the CEAPIS channels will continue to be performed in a similar manner and frequency as before. The proposed amendment requires verification that CEAs are positioned within 12 inches of other CEAs in the group and requires a more prompt determination of CEA positions following CEA movements if a CEAPIS channel is inoperable. Therefore, the proposed amendment does not have an adverse impact which could cause the non-trippable CEAs to be malpositioned.

4.1.3 Approved Methodologies

Regulatory Guide 1.97, "Instrumentation for Light-Water-Cooled Nuclear Power Plants to Assess Plant and Environs Conditions During and Following an Accident," Revision 2, December 1980.

4.1.4 Analysis

No analysis was conducted in support of this license amendment request (LAR).

4.2 Precedent

The portion of the proposed amendment pertaining to CEA position indication is consistent with LCO 3.1.4, "Control Rod Alignment," Action A, and associated SRs 3.1.4.1 and 3.1.4.2 of NUREG-1432; "Standard Technical Specifications - Combustion Engineering Plants," Revision 1 dated April 1995 as approved for the Palisades Plant. (Reference 6.7) Like Palisades, FCS is a CE Analog plant of similar vintage (e.g., Palisades was issued its Operating License in 1971 while FCS obtained its in 1973) and has similar CEA position indication systems based on primary indication from synchros and secondary indication from reed switches.

4.3 Significant Hazards Consideration

The Omaha Public Power District (OPPD) is proposing to revise Technical Specification (TS) 2.15, Table 2-5, by adding Note e, which will be applicable when either the primary control element assembly (CEA) position indication system (CEAPIS) channel or the secondary CEAPIS channel is inoperable for one or more CEAs. Note e modifies the requirements of TS 2.15, Table 2-5, Item 1 to require the performance of a new CEA position verification surveillance requirement (TS 3.1, Table 3-3, Item 4) within 15 minutes following any CEA motion in that group. Note e also clarifies that CEAPIS channels are not subject to the requirements of TS 2.15(1), (2), and (3). TS 3.1, Table 3-3, Item 4, will verify each shift (unless invoked more frequently by TS 2.15, Table 2-5, Note e), that the position of each CEA is within 12 inches of all other CEAs in its group. The proposed revision to TS 3.1, Table 3-3, Items 1.a and 2.a, eliminates the requirement for a check of primary CEAPIS data with secondary CEAPIS data and vice versa each shift and will instead require the performance of a CHANNEL CHECK. The change proposed for TS 2.10.2(7)c is more consistent with Combustion Engineering (CE) Standard Technical Specifications (STS).

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

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

Response: No.

The proposed amendment will allow plant operation to continue when a CEAPIS channel is inoperable by requiring prompt verification of CEA positions following CEA movement. CEAs are most likely to become misaligned during movement and therefore, this change will cause CEA alignment errors to be promptly detected and corrected. It is appropriate to clarify that CEAPIS channels are not subject to the requirements of TS 2.15(1), (2), and (3) as they are not designed to be placed in trip or bypass, nor are they engineered safety feature (ESF) or isolation logic subsystems.

The proposed amendment does not alter the requirements of TS 2.15(4) regarding the rod block function of the secondary CEAPIS channel. Should the secondary CEAPIS channel or its rod block function be inoperable, several additional CEA deviation events are possible. However, this situation is already addressed by TS 2.15(4), which requires the CEAs (rods) to be maintained fully withdrawn with the control rod drive system mode switch in the off position except when manual motion of CEA Group 4 is required to control axial power distribution. This is the same position that the CEAs must be in (fully withdrawn) when the plant is at power (Mode 1) in order to utilize distributed control system (DCS) core mimic to CHANNEL CHECK the CEAPIS channels.

If it was not possible to use DCS core mimic to verify the primary CEAPIS channel as would be the case if CEA Group 4 was inserted to control axial power distribution, then the primary CEAPIS channel would be declared inoperable when the CHANNEL CHECK could not be accomplished. The plant would then be placed in hot shutdown (Mode 3) within 12 hours in accordance with TS 2.15(4). Therefore, although the proposed amendment will allow a CEAPIS channel to be inoperable indefinitely, there is no significant increase in the probability or consequences of an accident as the requirements of TS 2.15(4) will continue to be met. This serves to prevent the type of CEA deviation events that the rod block function was designed for.

Replacing the current method of verifying CEAPIS data with the defined term CHANNEL CHECK is an improvement that provides additional flexibility without weakening the intent of the surveillance. As a result, when it is feasible to obtain CEA position indication from DCS core mimic (i.e., when the CEAs are either fully inserted or fully withdrawn), the primary and secondary CEAPIS channels will be compared with DCS core mimic indication as well as each other.

As an additional means of verifying CEA positions, DCS core mimic indication provides added confidence that the CEAs are in the indicated positions. Should the primary or secondary CEAPIS channel become inoperable, the accuracy and reliability of DCS core mimic indication is assured by its previous comparison with both OPERABLE channels. Comparison of the OPERABLE CEAPIS channel with DCS core mimic will satisfy the required CHANNEL CHECK and allow continued operation while the inoperable channel is repaired. The proposed amendment ensures that the CEA alignment required by TS 2.10.2(4) is met each shift by requiring all full length (shutdown and regulating) CEAs to be positioned within 12 inches of all other CEAs in the group.

The change proposed for TS 2.10.2(7)c incorporates more conservative wording to ensure that the regulating CEA groups are maintained within the Long Term

Insertion Limit. The proposed change will ensure that corrective actions are taken if either time interval is exceeded and makes TS 2.10.2(7)c more consistent with CE STS.

The proposed amendment does not alter the plant configuration, require new plant equipment to be installed, alter accident analysis assumptions, add any initiators, or affect the function of plant systems or the manner in which systems are operated, maintained, modified, tested, or inspected. As an additional means of verifying primary and secondary CEAPIS data, DCS core mimic indication increases confidence in the reliability of CEAPIS data.

The proposed amendment will help minimize unplanned shutdowns that can cause plant transients yet continues to ensure that power distribution and reactivity limits are maintained. Therefore, it is concluded that this change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

Response: No.

The proposed amendment does not change the design function or operation of the primary or secondary CEAPIS channels. If one CEAPIS channel should become inoperable, the position of CEAs will be verified within 15 minutes of any CEA movement to quickly detect and correct CEA alignment errors. Data from each CEAPIS channel will continue to be compared to the other channel each shift as before. However, a CHANNEL CHECK will require that CEAPIS channel data also be compared with DCS core mimic indication when it is available. Thus, when the CEAPIS channels are required to be OPERABLE, there will be at least two means of verifying the position of CEAs or else appropriate actions must be taken. The CEA alignment required by TS 2.10.2(4) is assured by requiring verification each shift that all full length (shutdown and regulating) CEAs are positioned within 12 inches of all other CEAs in the group.

No changes are proposed to testing and calibration of the CEAPIS channels and these requirements will continue to ensure that they are capable of performing their design function. Use of the defined term CHANNEL CHECK is an appropriate surveillance method as it requires that the channel be compared with other independent channels measuring the same variable where feasible. DCS core mimic is a diverse, accurate and reliable means of verifying CEA positions when the CEAs are fully inserted or fully withdrawn. The change proposed for

TS 2.10.2(7)c ensures that appropriate corrective actions are taken when the regulating CEA groups are below the Long Term Insertion Limit in excess of either of the specified time intervals.

No new structures, systems, or components (SSCs) are being installed, and no credible new failure mechanisms, malfunctions, or accident initiators are created. Therefore, the proposed amendment does not create the possibility of a new or different kind of accident from any previously evaluated.

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

Response: No.

When a CEAPIS channel is inoperable, the proposed amendment allows plant operation to continue but requires more frequent verification of CEA positions following any CEA movement, which is when CEAs are most likely to become misaligned. This will enable CEA alignment errors to be detected and corrected more promptly. As CEAPIS channels are not designed to be placed in trip or bypass, nor are they engineered safety feature (ESF) or isolation logic subsystems, it is appropriate to clarify that TS 2.15(1), (2), and (3) do not apply. FCS normally operates with the CEAs fully withdrawn and maintains reactivity control by adjusting reactor coolant system (RCS) boric acid concentration. When the CEAs are fully withdrawn (or fully inserted), DCS core mimic indication provides accurate and reliable indication of CEA positions suitable for comparison with the primary and secondary CEAPIS channels. Thus, even with one CEAPIS channel inoperable, a diverse means of verifying the accuracy of the OPERABLE CEAPIS channel will be available. The accuracy and reliability of DCS core mimic is assured by testing conducted each refueling outage with continued assurance provided by comparison with primary and secondary CEAPIS each shift.

The change also ensures that the CEA alignment required by TS 2.10.2(4) is met each shift by requiring all full length (shutdown and regulating) CEAs to be positioned within 12 inches of all other CEAs in the group. The proposed amendment does not alter the TS 2.15(4) requirement to place the reactor in hot shutdown in the event that both CEAPIS channels are inoperable. The change proposed for TS 2.10.2(7)c incorporates more conservative wording to ensure that the regulating CEA groups are maintained within the Long Term Insertion Limit.

The proposed amendment will help minimize unplanned shutdowns that can cause plant transients yet continues to ensure that power distribution and reactivity limits are maintained. The proposed amendment does not alter the plant configuration, require new plant equipment to be installed, alter accident analysis assumptions, add any initiators, or affect the function of plant systems or the manner in which systems are operated, maintained, modified, tested, or inspected. Therefore, the proposed amendment does not involve a significant reduction in a margin of safety.

Based on the above, OPPD concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

5.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure.

Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 REFERENCES

6.1 NUREG-1432, “Standard Technical Specifications - Combustion Engineering Plants,” Revision 3.0, dated June 2004
6.2 USAR Section 1.9, “Design Comparison with Other Plants”
6.3 USAR Section 3.4.1, “Reactivity and Control Requirements”
6.4 USAR Section 3.7.2, “Control Element Drive Mechanism”
6.5 USAR Section 7.5.3, “CEA Position Instrumentation”
6.6 OP-ST-CEA-0006, “Refueling Control Element Assembly (CEA) Group Indicating Lights and Rod Drop Test”
6.7 NUREG-1432, “Standard Technical Specifications - Combustion Engineering Plants,” Revision 1 dated April 1995 as approved for the Palisades Plant

Technical Specification and Bases Page Markups[1]

[1] Deleted text shown in ~~strikeout~~; added text in underline.

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.10 Reactor Core (Continued)
2.10.2 Reactivity Control Systems and Core Physics Parameters Limits (Continued)

b. When the regulating CEA groups are inserted beyond the Long Term Insertion Limit for a time interval in excess of 4 hours per 24 hour interval, operation may proceed deleting this daily restriction, provided either:

(i) Regulating CEA groups are not inserted below the Short Term Insertion Limit, or

(ii) Regulating CEA groups are not inserted below the Transient Insertion Limit and rates of power increases initiated when the regulating CEA's are inserted below the Short Term Insertion Limit are less than 5%/hour.

c. When the regulating CEA groups are inserted below the Long Term Insertion Limit for time intervals in excess of 4 EFPD per 30 EFPD interval ~~and~~ or in excess of 14 EFPD per fuel cycle, either:

(i) Restore the regulating groups to within the Long Term Insertion Limit within two hours, or

(ii) Be in hot shutdown within 6 hours.

(8) CEA Drop Time

The individual full length (shutdown and regulating) CEA drop time, from a fully withdrawn position, shall be ≤ 2.5 seconds from the time the clutch coil is de-energized until the CEA reaches its 90 percent insertion position with:

a. $T_{cold} \geq$ 515°F, and
b. All reactor coolant pumps operating.

With the drop time of any full length CEA determined to exceed the above limit, restore the CEA drop time to within the above limit prior to proceeding to hot standby or power operation.

(9) Test Exemption

a. CEA Insertion Limits and Misalignment

(i) The insertion limits of Specification 2.10.2 may be suspended during the performance of physics tests provided:

TABLE 2-5

Instrumentation Operating Requirements for Other Safety Feature Functions

No.	Functional Unit	Minimum Operable Channels	Minimum Degree of Redundancy	Permissible Bypass Condition
1	CEA Position Indication Systems	1[(e)]	None	None
2	Pressurizer Level	1	None	Not Applicable
3	PORV Acoustic Position Indication-Direct	1[(a)(c)]	None	Not Applicable
4	Safety Valve Acoustic Position Indication	1[(a)(c)]	None	Not Applicable
5	PORV/Safety Valve Tail Pipe Temperature	1[(d)(b)]	None	Not Applicable

NOTES:

a One channel per valve.
b One RTD for both PORV's; two RTD's, one for each code safety.
c If item 5 is operable, requirements of specification 2.15 are modified for items 3 and 4[i] to "Restore inoperable channels to operability within 7 days or be in hot shutdown within 12 hours."
d If items 3 and 4 are operable, requirements of specification 2.15 are modified for item 5 to "Restore inoperable channels to operability within 7 days or be in hot shutdown within 12 hours."
e If one channel of CEA position indication is inoperable for one or more CEAs, requirements of specification 2.15 are modified for item 1 to "Perform TS 3.1, Table 3-3, Item 4 within 15 minutes following any CEA motion in that group." Specifications 2.15(1), (2), and (3) are not applicable.

i The requirement of Table 2-5, Note c to restore Safety Valve Acoustic Position Indication in 7 days is extended on a one-time basis. This allows the instrumentation for Functional Unit 4 for pressurizer safety valve RC-142 to be inoperable from June 1, 2010 until the next entry into Mode 3 from Mode 4.

TABLE 3-3

MINIMUM FREQUENCIES FOR CHECKS, CALIBRATIONS AND TESTING OF MISCELLANEOUS INSTRUMENTATION AND CONTROLS

Channel Description	Surveillance Function	Frequency	Surveillance Method
1. Primary CEA Position Indication System	a. Check	S	a. ~~Comparison of output data with secondary CEAPIS.~~ CHANNEL CHECK
	b. Test	M	b. Test of power dependent insertion limits, deviation, and sequence monitoring systems.
	c. Calibrate	R	c. Physically measured CEDM position used to verify system accuracy. Calibrate CEA position interlocks.
2. Secondary CEA Position Indication System	a. Check	S	a. ~~Comparison of output data with primary CEAPIS.~~ CHANNEL CHECK
	b. Test	M	b. Test of power dependent insertion limit, deviation, out-of-sequence, and overlap monitoring systems.
	c. Calibrate	R	c. Calibrate secondary CEA position indication system and CEA interlock alarms.
3. Area and Post-Accident Radiation Monitors[(1)]	a. Check	D	a. CHANNEL CHECK
	b. Test	Q	b. CHANNEL FUNCTIONAL TEST
	c. Calibrate	R	c. Secondary and Electronic calibration performed at refueling frequency. Primary calibration with exposure to radioactive sources only when required by the secondary and electronic calibration. RM-091 A/B - Calibration by electronic signal substitution is acceptable for all range decades above 10 R/hr. Calibration for at least one decade below 1-R/hr. shall be by means of calibrated radiation source.

[(1)]Post Accident Radiation Monitors are: RM-063, RM-064, and RM-091A/B. Area Radiation Monitors are: RM-070 thru RM-082, RM-084 thru RM-089, and RM-095 thru RM-098.

TABLE 3-3 (Continued)

MINIMUM FREQUENCIES FOR CHECKS, CALIBRATIONS AND TESTING OF MISCELLANEOUS INSTRUMENTATION AND CONTROLS

Channel Description	Surveillance Function	Frequency	Surveillance Method
4. ~~DELETED~~CEA Position	a. Check	S	a. Verify the position of each CEA to be within 12 inches of all other CEAs in the group.
5. Primary to Secondary Leak-Rate Detection Radiation Monitors (RM-054A/B, RM-057)	a. Check	D	a. CHANNEL CHECK
	b. Test	Q	b. CHANNEL FUNCTIONAL TEST
	c. Calibrate	R	c. Secondary and Electronic calibration performed at refueling frequency. Primary Calibration performed with exposure to radioactive sources only when required by the secondary and electronic calibration.
6. Pressurizer Level	a. Check	S	a. Verify that level is within limits.
	b. Check	M	b. CHANNEL CHECK
	c. Calibrate	R	c. CHANNEL CALIBRATION
7. CEA Drive System Interlocks	a. Test	R	a. Verify proper operation of all CEDM system interlocks, using simulated signals where necessary.
	b. Test	P	b. If haven't been checked for three months and plant is shutdown.

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.15 Instrumentation and Control Systems (Continued)

Basis (Continued)

Operability of the primary CEA position indication system (CEAPIS) channel and the secondary CEAPIS channel is required to determine CEA positions and thereby ensure compliance with the CEA alignment and insertion limits of TS 2.10.2. The primary CEAPIS channel utilizes the output of a synchro transmitter geared to the clutch output shaft. CEA position is displayed visually at the main control panel.

The secondary CEAPIS channel utilizes the output of a voltage divider network controlled by a series of reed switches. The reed switches are actuated by a permanent magnet attached to the rack assembly. Position information is supplied to the distributed control system (DCS) flat-panel touch monitors for simultaneous viewing of all CEA group positions.

Limit switches on the regulating CEAs and reed switches on the shutdown CEAs provide an additional means of determining CEA position when the CEAs are fully inserted or fully withdrawn. ~~However, even when the CEAs are fully inserted or fully withdrawn, this indication (displayed on the DCS) can not be used in lieu of CEAPIS data to meet the shiftly CEAPIS channel check, which requires primary CEAPIS data to verify secondary CEAPIS data and vice versa.~~

CEA position indication is required to allow verification that the CEAs are positioned and aligned as assumed in the safety analysis. If one CEA position indication channel is inoperable for one or more CEAs then TS 3.1, Table 3-3, Item 4 (CEA position verification) is required to be performed once within 15 minutes following any CEA motion in that group. This ensures that the CEAs are positioned as required.

The operability of the Alternate Shutdown Panel (AI-185), including Wide Range Logarithmic Power and Source Range Monitors on AI-212, and Emergency Auxiliary Feedwater Panel (AI-179) instrument and control circuits ensures that sufficient capability is available to permit entry into and maintenance of the Hot Shutdown Mode from locations outside of the Control Room. This capability is required in the event that Control Room habitability is lost due to fire in the cable spreading room or Control Room.

Variances which may exist at startup between the more accurate ΔT-Power and Nuclear Instrumentation Power (NI-Power) are not significant for enabling of the trip functions. By 15% of rated power as measured by the uncalibrated NI Power, the Axial Power Distribution (APD) and Loss of Load (LOL) trip functions are enabled while the High Rate of Change of Power trip is bypassed.

The APD trip function acts to limit the axial power shape to the range assumed in the setpoint analysis. Significant margins to local power density limits exist at 15% power, as well as power levels up to at least 30% (where NI calibration occurs).

The LOL trip function acts as an anticipatory trip for the high pressurizer pressure and high power trips in order to limit the severity of a LOL transient. This trip is not credited in the USAR Chapter 14 Safety Analyses and any variance between ΔT-Power and NI-Power has no effect on the safety analysis.

3.0 SURVEILLANCE REQUIREMENTS

3.1 Instrumentation and Control (Continued)

Substantial calibration shifts within a channel (essentially a channel failure) will be revealed during routine checking and testing procedures.

The minimum calibration frequencies of once-per-day (heat balance adjustment only) for the power range safety channels, and once each refueling shutdown for the process system channels, are considered adequate.

The minimum testing frequency for those instrument channels connected to the Reactor Protective System and Engineered Safety Features is based on ABB/CE probabilistic risk analyses and the accumulation of specific operating history. The quarterly frequency for the channel functional tests for these systems is based on the analyses presented in the NRC approved topical report CEN-327-A, "RPS/ESFAS Extended Test Interval Evaluation," as supplemented, and OPPD's Engineering Analysis EA-FC-93-064, "RPS/ESF Functional Test Drift Analysis."

The low temperature setpoint power operated relief valve (PORV) CHANNEL FUNCTIONAL TEST verifies operability of the actuation circuitry using the installed test switches. PORV actuation could depressurize the reactor coolant system and is not required.

~~Although limit switch and reed switch indication is an additional means of determining CEA positions when the CEAs are fully withdrawn or fully inserted, it is not an accepted alternative to comparison of primary and secondary CEAPIS output data for meeting the channel check surveillance.~~

OPERABILITY of two CEA position indication system (CEAPIS) channels is required to determine CEA positions, and thereby ensure compliance with the CEA alignment and insertion limits. Limit switches on the regulating CEAs and reed switches on the shutdown CEAs provide an additional means of determining CEA positions when the CEAs are at either their fully inserted or fully withdrawn positions. This indication displayed on the distributed control system (DCS) flat-panel touch monitors is known as DCS core mimic. Performance of a CHANNEL CHECK on the primary and secondary CEAPIS channels includes comparison with DCS core mimic (when available), which provides confidence in the accuracy of the CEAPIS channels and DCS core mimic. The Frequency of each shift takes into consideration other information continuously available to the operator in the control room, so that during CEA movement, deviations can be detected.

Verification that individual CEA positions are within 12 inches of all other CEAs in the group at a Frequency of each shift allows the operator to detect a CEA that is beginning to deviate from its expected position. The specified Frequency takes into account other CEA position information that is continuously available to the operator in the control room, so that during CEA movement, deviations can be detected. Protection is also provided by the CEA deviation alarm.

Calibration of instrument channels with resistance temperature detector (RTD) or thermocouple sensors may consist of an inplace qualitative assessment of sensor behavior and normal calibration of the remaining adjustable devices in the channel. Whenever a sensing element is replaced, the next required CHANNEL CALIBRATION shall include an inplace cross calibration that compares the other sensing elements with the recently installed sensing element. The CHANNEL CALIBRATION may be performed by means of any series of sequential, overlapping, or total channel steps so that the entire channel is calibrated.

Retyped ("Clean") Technical Specification and Bases Pages

2.0 **LIMITING CONDITIONS FOR OPERATION**
2.10 Reactor Core (Continued)
2.10.2 Reactivity Control Systems and Core Physics Parameters Limits (Continued)

b. When the regulating CEA groups are inserted beyond the Long Term Insertion Limit for a time interval in excess of 4 hours per 24 hour interval, operation may proceed deleting this daily restriction, provided either:

(iii) Regulating CEA groups are not inserted below the Short Term Insertion Limit, or

(iv) Regulating CEA groups are not inserted below the Transient Insertion Limit and rates of power increases initiated when the regulating CEA's are inserted below the Short Term Insertion Limit are less than 5%/hour.

c. When the regulating CEA groups are inserted below the Long Term Insertion Limit for time intervals in excess of 4 EFPD per 30 EFPD interval or in excess of 14 EFPD per fuel cycle, either:

(iii) Restore the regulating groups to within the Long Term Insertion Limit within two hours, or

(iv) Be in hot shutdown within 6 hours.

(8) CEA Drop Time

The individual full length (shutdown and regulating) CEA drop time, from a fully withdrawn position, shall be ≤ 2.5 seconds from the time the clutch coil is de-energized until the CEA reaches its 90 percent insertion position with:

a. T_{cold} ≥ 515°F, and
b. All reactor coolant pumps operating.

With the drop time of any full length CEA determined to exceed the above limit, restore the CEA drop time to within the above limit prior to proceeding to hot standby or power operation.

(9) Test Exemption

a. CEA Insertion Limits and Misalignment

(ii) The insertion limits of Specification 2.10.2 may be suspended during the performance of physics tests provided:

TABLE 2-5

Instrumentation Operating Requirements for Other Safety Feature Functions

No.	Functional Unit	Minimum Operable Channels	Minimum Degree of Redundancy	Permissible Bypass Condition
1	CEA Position Indication Systems	1[(e)]	None	None
2	Pressurizer Level	1	None	Not Applicable
3	PORV Acoustic Position Indication-Direct	1[(a)(c)]	None	Not Applicable
4	Safety Valve Acoustic Position Indication	1[(a)(c)]	None	Not Applicable
5	PORV/Safety Valve Tail Pipe Temperature	1[(d)(b)]	None	Not Applicable

NOTES:

a One channel per valve.
b One RTD for both PORV's; two RTD's, one for each code safety.
c If item 5 is operable, requirements of specification 2.15 are modified for items 3 and 4[i] to "Restore inoperable channels to operability within 7 days or be in hot shutdown within 12 hours."
d If items 3 and 4 are operable, requirements of specification 2.15 are modified for item 5 to "Restore inoperable channels to operability within 7 days or be in hot shutdown within 12 hours."
e If one channel of CEA position indication is inoperable for one or more CEAs, requirements of specification 2.15 are modified for item 1 to "Perform TS 3.1, Table 3-3, Item 4 within 15 minutes following any CEA motion in that group." Specifications 2.15(1), (2), and (3) are not applicable.

i The requirement of Table 2-5, Note c to restore Safety Valve Acoustic Position Indication in 7 days is extended on a one-time basis. This allows the instrumentation for Functional Unit 4 for pressurizer safety valve RC-142 to be inoperable from June 1, 2010 until the next entry into Mode 3 from Mode 4.

TABLE 3-3

MINIMUM FREQUENCIES FOR CHECKS, CALIBRATIONS AND TESTING OF MISCELLANEOUS INSTRUMENTATION AND CONTROLS

Channel Description	Surveillance Function	Frequency	Surveillance Method
1. Primary CEA Position Indication System	a. Check	S	a. CHANNEL CHECK
	b. Test	M	b. Test of power dependent insertion limits, deviation, and sequence monitoring systems.
	c. Calibrate	R	c. Physically measured CEDM position used to verify system accuracy. Calibrate CEA position interlocks.
2. Secondary CEA Position Indication System	a. Check	S	a. CHANNEL CHECK
	b. Test	M	b. Test of power dependent insertion limit, deviation, out-of-sequence, and overlap monitoring systems.
	c. Calibrate	R	c. Calibrate secondary CEA position indication system and CEA interlock alarms.
3. Area and Post-Accident Radiation Monitors(1)	a. Check	D	a. CHANNEL CHECK
	b. Test	Q	b. CHANNEL FUNCTIONAL TEST
	c. Calibrate	R	c. Secondary and Electronic calibration performed at refueling frequency. Primary calibration with exposure to radioactive sources only when required by the secondary and electronic calibration. RM-091 A/B - Calibration by electronic signal substitution is acceptable for all range decades above 10 R/hr. Calibration for at least one decade below 1-R/hr. shall be by means of calibrated radiation source.

(1)Post Accident Radiation Monitors are: RM-063, RM-064, and RM-091A/B. Area Radiation Monitors are: RM-070 thru RM-082, RM-084 thru RM-089, and RM-095 thru RM-098.

TABLE 3-3 (Continued)

MINIMUM FREQUENCIES FOR CHECKS, CALIBRATIONS AND TESTING OF MISCELLANEOUS INSTRUMENTATION AND CONTROLS

Channel Description	Surveillance Function	Frequency	Surveillance Method
4. CEA Position	a. Check	S	a. Verify the position of each CEA to be within 12 inches of all other CEAs in the group.
5. Primary to Secondary Leak-Rate Detection Radiation Monitors (RM-054A/B, RM-057)	a. Check	D	a. CHANNEL CHECK
	b. Test	Q	b. CHANNEL FUNCTIONAL TEST
	c. Calibrate	R	c. Secondary and Electronic calibration performed at refueling frequency. Primary Calibration performed with exposure to radioactive sources only when required by the secondary and electronic calibration.
6. Pressurizer Level	a. Check	S	a. Verify that level is within limits.
	b. Check	M	b. CHANNEL CHECK
	c. Calibrate	R	c. CHANNEL CALIBRATION
7. CEA Drive System Interlocks	a. Test	R	a. Verify proper operation of all CEDM system interlocks, using simulated signals where necessary.
	b. Test	P	b. If haven't been checked for three months and plant is shutdown.

2.0 LIMITING CONDITIONS FOR OPERATION

2.15 Instrumentation and Control Systems (Continued)

Basis (Continued)

Operability of the primary CEA position indication system (CEAPIS) channel and the secondary CEAPIS channel is required to determine CEA positions and thereby ensure compliance with the CEA alignment and insertion limits of TS 2.10.2. The primary CEAPIS channel utilizes the output of a synchro transmitter geared to the clutch output shaft. CEA position is displayed visually at the main control panel.

The secondary CEAPIS channel utilizes the output of a voltage divider network controlled by a series of reed switches. The reed switches are actuated by a permanent magnet attached to the rack assembly. Position information is supplied to the distributed control system (DCS) flat-panel touch monitors for simultaneous viewing of all CEA group positions.

Limit switches on the regulating CEAs and reed switches on the shutdown CEAs provide an additional means of determining CEA position when the CEAs are fully inserted or fully withdrawn.

CEA position indication is required to allow verification that the CEAs are positioned and aligned as assumed in the safety analysis. If one CEA position indication channel is inoperable for one or more CEAs then TS 3.1, Table 3-3, Item 4 (CEA position verification) is required to be performed once within 15 minutes following any CEA motion in that group. This ensures that the CEAs are positioned as required.

The operability of the Alternate Shutdown Panel (AI-185), including Wide Range Logarithmic Power and Source Range Monitors on AI-212, and Emergency Auxiliary Feedwater Panel (AI-179) instrument and control circuits ensures that sufficient capability is available to permit entry into and maintenance of the Hot Shutdown Mode from locations outside of the Control Room. This capability is required in the event that Control Room habitability is lost due to fire in the cable spreading room or Control Room.

Variances which may exist at startup between the more accurate ΔT-Power and Nuclear Instrumentation Power (NI-Power) are not significant for enabling of the trip functions. By 15% of rated power as measured by the uncalibrated NI Power, the Axial Power Distribution (APD) and Loss of Load (LOL) trip functions are enabled while the High Rate of Change of Power trip is bypassed.

The APD trip function acts to limit the axial power shape to the range assumed in the setpoint analysis. Significant margins to local power density limits exist at 15% power, as well as power levels up to at least 30% (where NI calibration occurs).

The LOL trip function acts as an anticipatory trip for the high pressurizer pressure and high power trips in order to limit the severity of a LOL transient. This trip is not credited in the USAR Chapter 14 Safety Analyses and any variance between ΔT-Power and NI-Power has no effect on the safety analysis.

3.0 SURVEILLANCE REQUIREMENTS

3.1 Instrumentation and Control (Continued)

Substantial calibration shifts within a channel (essentially a channel failure) will be revealed during routine checking and testing procedures.

The minimum calibration frequencies of once-per-day (heat balance adjustment only) for the power range safety channels, and once each refueling shutdown for the process system channels, are considered adequate.

The minimum testing frequency for those instrument channels connected to the Reactor Protective System and Engineered Safety Features is based on ABB/CE probabilistic risk analyses and the accumulation of specific operating history. The quarterly frequency for the channel functional tests for these systems is based on the analyses presented in the NRC approved topical report CEN-327-A, "RPS/ESFAS Extended Test Interval Evaluation," as supplemented, and OPPD's Engineering Analysis EA-FC-93-064, "RPS/ESF Functional Test Drift Analysis."

The low temperature setpoint power operated relief valve (PORV) CHANNEL FUNCTIONAL TEST verifies operability of the actuation circuitry using the installed test switches. PORV actuation could depressurize the reactor coolant system and is not required.

OPERABILITY of two CEA position indication system (CEAPIS) channels is required to determine CEA positions, and thereby ensure compliance with the CEA alignment and insertion limits. Limit switches on the regulating CEAs and reed switches on the shutdown CEAs provide an additional means of determining CEA positions when the CEAs are at either their fully inserted or fully withdrawn positions. This indication displayed on the distributed control system (DCS) flat-panel touch monitors is known as DCS core mimic. Performance of a CHANNEL CHECK on the primary and secondary CEAPIS channels includes comparison with DCS core mimic (when available), which provides confidence in the accuracy of the CEAPIS channels and DCS core mimic. The Frequency of each shift takes into consideration other information continuously available to the operator in the control room, so that during CEA movement, deviations can be detected.

Verification that individual CEA positions are within 12 inches of all other CEAs in the group at a Frequency of each shift allows the operator to detect a CEA that is beginning to deviate from its expected position. The specified Frequency takes into account other CEA position information that is continuously available to the operator in the control room, so that during CEA movement, deviations can be detected. Protection is also provided by the CEA deviation alarm.

Calibration of instrument channels with resistance temperature detector (RTD) or thermocouple sensors may consist of an inplace qualitative assessment of sensor behavior and normal calibration of the remaining adjustable devices in the channel. Whenever a sensing element is replaced, the next required CHANNEL CALIBRATION shall include an inplace cross calibration that compares the other sensing elements with the recently installed sensing element. The CHANNEL CALIBRATION may be performed by means of any series of sequential, overlapping, or total channel steps so that the entire channel is calibrated.