Arizona Public Service's Evaluation

Subject: Request for Amendment to Technical Specifications

3.2.4, Departure From Nucleate Boiling Ratio (DNBR)

3.3.1, Reactor Protective System (RPS) Instrumentation - Operating

3.3.3, Control Element Assembly Calculators (CEACs)

1.0 DESCRIPTION

This letter is a request to amend Operating Licenses NPF-41, NPF-51, and NPF-74 for Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2, and 3, respectively.

The proposed change would revise the Operating Licenses to support replacement/ upgrade of the existing Core Protection Calculator System (CPCS) which consists of both the Core Protection Calculators (CPCs) and Control Element Assembly Calculators (CEACs). The new CPCS design would be implemented for Cycle 12 in all three PVNGS units, which are expected to begin as follows:

Unit 2, Cycle 12 - Fall 2003
Unit 1, Cycle 12 - Spring 2004
Unit 3, Cycle 12 - Fall 2004

2.0 PROPOSED CHANGE

APS intends to replace the existing CPCS at PVNGS with a new, functionally equivalent, digital Common Qualified (or Common-Q) CPCS provided by Westinghouse Electric Power LLC (CE Nuclear Power LLC).

In the existing CPCS (Figure 2-1) there are only two Control Element Assembly Calculators (CEACs) physically mounted in channels B & C. There is only one CEAC 1 and one CEAC 2 in the entire four-channel CPCS. Each Control Element Assembly (CEA) position is measured by two redundant and independent Reed Switch Position Transmitters (RSPTs) associated with each CEA. Penalty factor outputs from each of these two CEAC channels are provided to all four Core Protection Calculator (CPC) channels via one-way isolated data links.

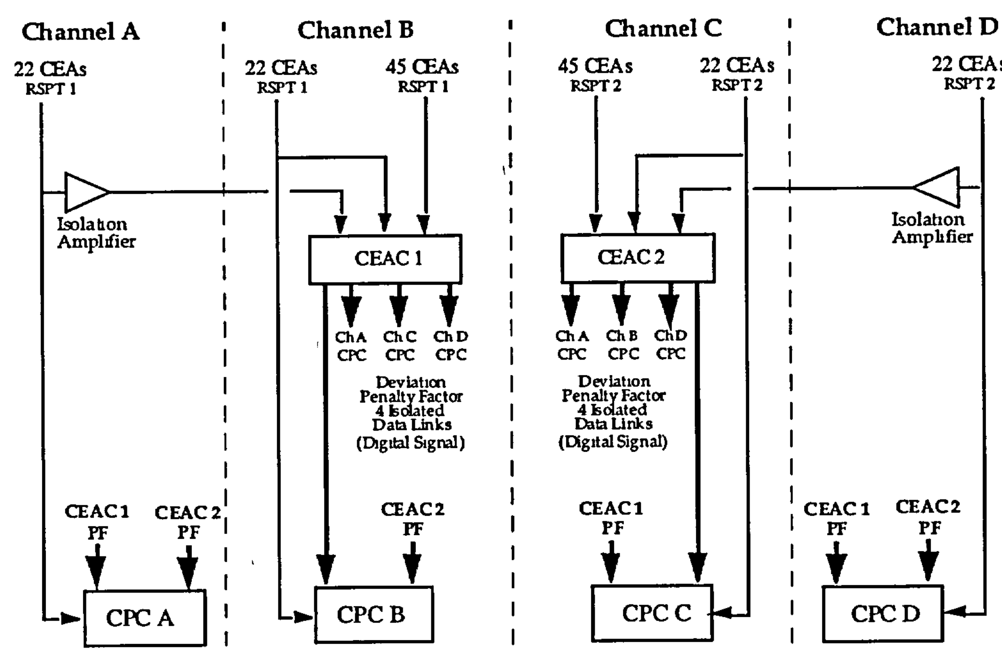

Figure 2-1
Existing CPCS

In the proposed replacement CPCS (Figure 2-2), there are eight CEACs, two in each CPC channel (i.e., a CEAC 1 and a CEAC 2 in each CPC channel), but the CEAC functionality remains the same. Each CEAC receives the same CEA inputs as in the present design. However, penalty factor outputs from the CEACs are used only in the associated CPC channel. In the replacement system, the CEA position inputs will undergo analog to digital conversion in the channel of origin, by means of redundant CEA position processors (CPPs 1 and 2) in each CPC channel. Converted CEA position is then transmitted to the associated CEAC 1 and CEAC 2 processors in each CPC channel.

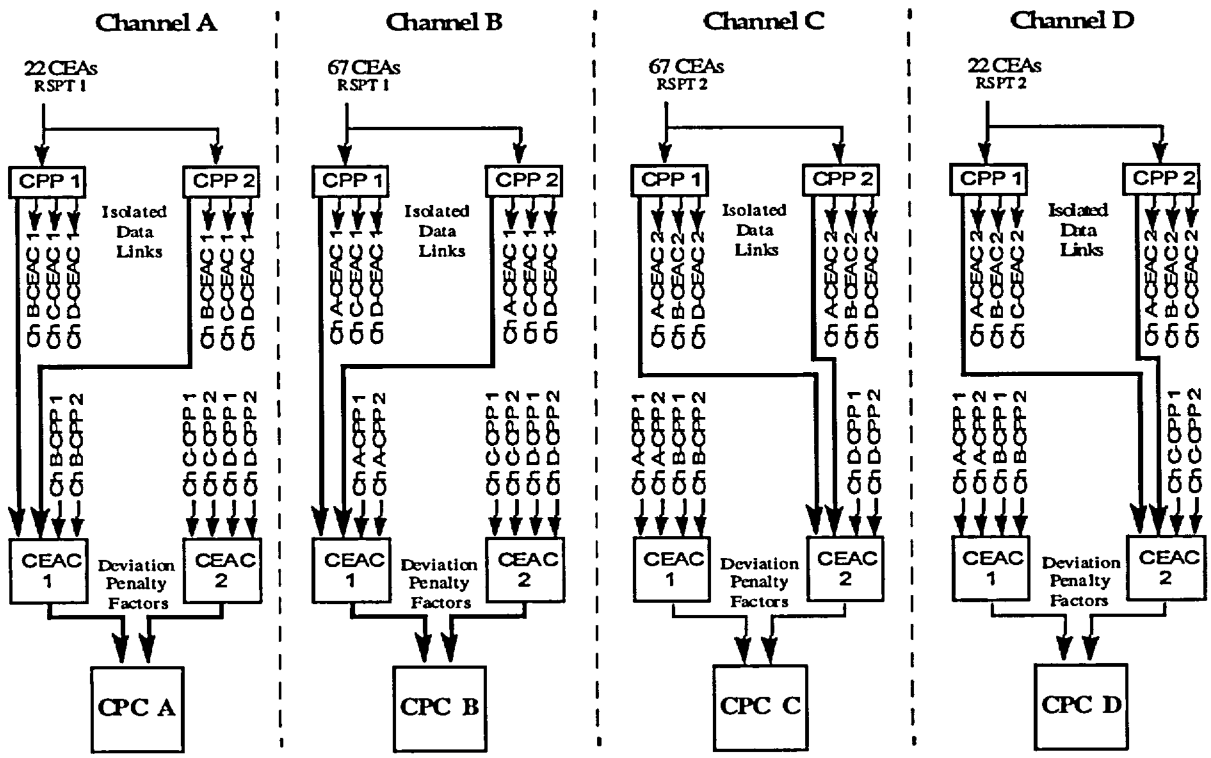

Figure 2-2

Proposed CPCS

The CPCS upgrade will require changes to LCOs 3.2.4 - Departure From Nucleate Boiling Ratio (DNBR), 3.3.1 - Reactor Protective System (RPS) Instrumentation, Operating, and 3.3.3 - Control Element Assembly Calculators (CEACs). Since the replacement CPCs are functionally similar to the existing CPCs, the majority of changes are to LCO 3.3.3 (CEACs). The changes to each section are justified below. The goal of this amendment is to maintain the same intent as the existing Technical Specification (TS) requirements.

Although CE Nuclear Power submitted draft markups to the CE Standard Technical Specifications in their Topical, the CEOG TSTF Subcommittee has reviewed the Topical and found that the changes were plant specific and did not support the basis for a generic Technical Specification Traveler Form (TSTF). Therefore, APS is processing the following changes specific to the Palo Verde TS as a plant specific change.

2.1 LCO 3.2.4, Departure From Nucleate Boiling Ratio (DNBR)

Introduction to LCO 3.2.4 Changes

LCO 3.2.4 provides for different responses depending on whether CEACs are operable or not. Because there are eight CEACs (two per CPC channel) in the replacement CPCS as opposed to the two total in the existing CPCS, a rewrite of this section is needed to maintain the same intent. In the existing CPCS, one inoperable CEAC would result in all four CPC channels receiving input from only one operable CEAC. Therefore, to maintain consistency, the existing paragraphs (a.) and (c.) will contain the condition "when at least one CEAC is operable in each operable CPC channel". This is reflected in the proposed LCO 3.2.4.a.1 and 3.2.4.b.1. Similarly, if neither CEAC is operable in each operable CPC channel, then the more conservative method for maintaining DNBR will be utilized. This is reflected in the proposed LCO 3.2.4.a.2 and 3.2.4.b.2. This LCO was also reformatted to group the conditions under headings of "Core Operating Limit Supervisory System (COLSS) In Service" and "COLSS Out of Service" for better comprehension.

2.2 LCO 3.3.1, Reactor Protective System (RPS) Instrumentation - Operating

Introduction to LCO 3.3.1 Changes

Design improvements in the replacement CPCS allow for changes to the TS that can not be realized with the existing CPCS. The bases and justification for these changes are described below.

LCO 3.3.1 Conditions, Required Actions, and Completion Time Changes

1. Condition E, "One or more core protection calculator (CPC) channels with a high cabinet temperature alarm", and associated Required Action will be deleted.

   In the presently installed CPCS, each CPC channel is equipped with two cabinet temperature switches that provide remote annunciation on high cabinet temperature conditions. In the replacement CPCS there are two cabinet temperature sensing RTDs per channel, each providing an analog temperature input measurement to different analog input modules. The cabinet temperature input allows for display of existing cabinet temperature on the Operator's Module (OM) and Maintenance Test Panel (MTP). The CPC processor monitors the RTDs and compares the temperature against a high temperature alarm setpoint and provides a digital output to the cabinet temperature high annunciator and a channel trouble alarm indication on the OM and MTP. The cabinet temperature alarm setpoint of 122 degrees F is well below the 140 degree F temperature to which the CPCS was subjected to during environmental testing.

The replacement CPCS possesses extensive online diagnostics to continuously monitor and assess channel functionality. These diagnostics address numerous failure conditions from many causes, temperature stress being only one such cause. Failures will be flagged by pertinent error messages and a channel trouble alarm on the OM and MTP. The design also has provisions for remote annunciation on channel trouble. The nature of the failure can be diagnosed from these locations. Therefore, since channel functionality is continuously self-diagnosed, Condition E and the associated Required Action are no longer required.

2. Condition F, "One or more core protection calculator (CPC) channels with three or more auto restarts during a 12 hour period", and associated Required Action will be deleted.

   In the presently installed CPCS, numerous failures result in an "auto restart" in which the CPC processor attempts to reinitialize and return to operation following a failure condition (e.g., floating point arithmetic fault, divided by zero, etc.). If the restart is successful due to a spurious failure condition, the CPC will resume normal (untripped) operation. The cause of the failure is logged at the CPC OM. It is possible for a marginally performing CPC channel processor to recover from repetitive failures. This Condition forces performance of a channel functional test if three or more such failure and restart conditions occur in a 12 hour period to assure the CPC is reliable.

   The replacement CPCS has no such auto restart capability. A processor failure will result in a HALT condition, in which the CPC processor remains in a tripped state, the watchdog timer times out, and maintenance personnel must perform a restart or repair of the affected module. Therefore, a marginally performing CPC processor cannot continue to remain in operation without deliberate action by the maintenance staff. Any repair will result in appropriate diagnostics being performed on the module to assure operability. Therefore, Condition F and the associated Required Action are no longer required.

LCO 3.3.1 Surveillance Requirement (SR) Changes

1. SR 3.3.1.3, "Check the CPC auto restart count", with a frequency of 12 hours will be changed to "Check the System Event Log", with a frequency of every 12 hours.

   As mentioned previously, the replacement CPCS does not have an auto restart feature. However, the CPCS does possess an extensive diagnostic repertoire, including the ability to detect I/O mode failures, datalink failures, and numerous other failures. Several hundred failure conditions are monitored in this manner and will illuminate a channel trouble lamp on the OM and MTP, provide appropriate diagnostic messages on a system status display page, and provide remote annunciation when a failure is detected. The system status display consists of two separate displays:

- The Systems Events List provides one or more pages of dynamic alarms and status information. This page includes all current diagnostic failures.
- The System Event Log provides historical alarm and status information, including a logging of the previous thirty diagnostic system failures from the System Events List. This list is intended to provide a historical measure of system reliability, and is an aid in diagnosing intermittent failures.

Because of the numerous redundant features in a CPC channel, including redundant input modules and data links, most of these failures will not in themselves cause CPC channel inoperability. Failures which render the channel inoperable, such as loss of both redundant CPC analog input modules, will additionally cause a CPC fail lamp on the OM and MTP, and annunciation, accompanied by channel low DNBR and high LPD trip outputs. Failure rendering a CEAC inoperable, such as loss of both redundant CEA position inputs on four or more CEAs, will similarly result in a CEAC fail lamp on the OM and MTP, and CEAC fail annunciation, as well as a CEAC fail flag to the associated CPC processor. The CPC will respond to a CEAC failure in the same manner as the CPC in the existing system. Multiple module or data link failures resulting in a loss of function, as indicated by a CPC fail, CEAC fail, CPC sensor fail, or CEAC sensor fail, and those resulting only in channel trouble alarm and logging on the System Events List/System Events Log is to aid the operator in establishing channel operability.

This surveillance requirement forces personnel to periodically review the failure log in order to ascertain channel performance, even if the individual failures do not render a channel inoperable. Failure to repair a faulty module could make the individual CPC susceptible to a single failure in the redundant module, in those cases when a redundant module exists. However, there is no requirement that all failures be addressed within a set time interval, unless they result in one of the other conditions (Fail/Sensor Fail) delineated above. The frequency of 12 hours reflects the nature of the surveillance, in which those failures that result in channel inoperability will independently cause a CPC fail condition, and CPC processor failure will result in a CPC HALT. Therefore, this surveillance requirement is of primary use in detecting failure of redundant features that may not be required for the CPC to perform its safety-related function.

2.3 LCO 3.3.3, Control Element Assembly Calculators (CEACs)

Introduction to LCO 3.3.3 Changes

TS changes are required to reflect the incorporation of two CEACs in all four CPC channels, rather than the two CEACs shared among the four CPCs of the existing CPCS design. In the replacement design, it will be possible to have CEACs inoperable in one or two CPC channels but still have an operable CEAC function in the remaining channels. There will be no change to the cabling of CEA position inputs to the CPCS. That is, RSPT 1 field inputs for approximately one quarter of the CEAs (the channel A target CEAs) are cabled in to CPC channel A. The remaining three-quarters of the RSPT 1 based CEA position inputs are cabled to CPC channel B. Similarly, approximately three quarters of the RSPT 2 CEA positions are cabled to CPC channel C, and the remaining one quarter of the RSPT 2 based CEA position inputs are cabled to CPC channel D.

In the existing CPCS, CEAC 1 is mounted in CPC channel B, and CEAC 2 is mounted in CPC channel C. Thus, CEAC 1 directly receives three quarters of its CEA position inputs from RSPT 1 directly from channel B, and the remaining one quarter of the RSPT 1 inputs from the channel A CEA Position Isolation Amplifier (CPIA) via an analog isolator. Similarly, CEAC 2 is located in channel C, where it receives three quarters of the RSPT 2 based inputs directly, and the remaining one quarter of the RSPT 2 based position inputs from channel D via a CPIA mounted in channel D. CEAC 1 monitors the position of all CEAs based upon RSPT 1 CEA position input, and CEAC 2 performs an identical function based upon RSPT 2. CEAC penalty factor outputs in the existing system are transmitted to all four CPC channels over one-way isolated data links. Thus, the CPCs in all four channels receive penalty factor inputs from both CEACs.

In the replacement system, the CEA position inputs will undergo analog to digital conversion in the channel of origin, by means of redundant CEA position processors (CPPs 1 and 2) in each CPC channel. Converted CEA position is then transmitted to all four channels, where a CEAC 1 and CEAC 2 processor reside. Since CPPs are redundant in each channel, a single CPP failure will not result in a loss of the CEA position transmission to the associated CEAC in the four CPC channels. However, it will still be possible for individual RSPT failures, which provide input to the both CPPs within a channel, to cause loss of a CEAC in multiple CPC channels.

Functionally, each CPC continues to receive penalty factors from two CEACs. However, failures in a single CEAC processor will only affect the CPC in the channel in which it resides. The proposed TS reflects this design. CEAC failures in one or two CPC channels may be treated as any other CPC channel failure as defined in existing LCO 3.3.1. Required Actions A.1 and B.1 of LCO 3.3.3 provide the option of declaring the affected CPC channel inoperable immediately. In the event of a single channel CEAC failure, this may be the preferred action, since the existing required actions for single channel inoperability in LCO 3.3.3 are based upon loss of the CEAC functions in all channels, which, in the new implementation, would not be the case.

LCO 3.3.3 Wording Changes

1. The wording of LCO 3.3.3 will be changed to "Two CEACs shall be operable in each CPC channel" from the existing "Two CEACs shall be operable".

   This reflects the presence of two CEACs in each CPC channel in the replacement design. All must be operable.

LCO 3.3.3 Conditions, Required Actions, and Completion Time Changes

1. A note will be added to the ACTION section to state "Separate Condition entry is allowed for each CPC channel".

   It is analogous to a similar note in LCO 3.3.1 ACTIONS and is required because of the applicability of the Required Actions to various combinations of CEAC failures among the four CPC channels. In the existing CPC implementation, loss of a CEAC results in a loss of that CEAC function to the four CPCs. In the replacement system, it is possible to lose one or both CEACs in individual CPC channels without a corresponding loss of CEAC functions to the remaining CPC channels.

2. Condition A will be reworded from "One CEAC Inoperable" to "One CEAC Inoperable in one or more CPC channels".

   This reflects the replacement design in which there are two CEACs in each CPC channel.

3. Required Action A.1, "Declare the affected CPC channel(s) inoperable" will be added to permit declaration of the CPC channel inoperable and allow entry into LCO 3.3.1 if this option is chosen.

   Thus, if there is a CEAC module or associated component failure leading to a CEAC inoperability in one or two CPC channels, this failure may be treated as any other RPS failure affecting one or two RPS channels. If a single channel is affected, Condition A in LCO 3.3.1, "one or more Functions with one automatic RPS trip channel inoperable", applies. If two RPS channels are affected (loss of one CEAC in two RPS channels), LCO 3.3.1 Condition B, "One or more functions with two automatic RPS trip channels inoperable", applies. This is a conservative approach, since inoperability of a single CEAC does not actually render a CPC channel inoperable. However, there may be cases where loss of individual channel CEACs may be better addressed by declaring the affected CPC channel inoperable, rather than performing SR 3.1.5.1, and restoring the

CEAC in seven days, which is the present Required Action for loss of a single CEAC per LCO 3.3.3.

4. The existing provisions of Actions A.1 and A.2 are retained as Required Actions A.2.1 and A.2.2. The identical completion times are also retained.

   The new Required Action A.1 may be used to allow entry into LCO 3.3.1 on loss of a single CEAC in up to four CPC channels. However, loss of one CEAC in one or more CPC channels does not render an RPS channel inoperable. Therefore, on loss of a single CEAC in one or more channels, the existing provisions of A.1 and A.2 are retained as Required Actions A.2.1 and A.2.2 of LCO 3.3.3.

5. Condition B, "Both CEACs inoperable" will be changed to "Both CEACs inoperable in one or more CPC channels.

   This reflects the replacement design, in which there are two CEACs in each CPC channel.

6. Required Action B.1, "Declare the affected CPC channel(s) inoperable", will be added.

   This will be added to permit immediate declaration of the affected CPC channel(s) inoperable and force entry into LCO 3.3.1. Thus, if both CEACs are inoperable in one or more CPC channels, this failure may be treated as any other CPC failure affecting one or more RPS channels. If a single CPC channel is affected, Condition A in LCO 3.3.1, "one or more Functions with one automatic RPS trip channel inoperable", applies. If two CPC channels are affected (loss of both CEACs in two CPC channels), LCO 3.3.1 Condition B, "One or more functions with two automatic RPS trip channels inoperable", applies. This is a conservative approach, since inoperability of both CEACs does not actually render a CPC channel inoperable. However, loss of both CEACs does force a large pre-assigned penalty factor, which would force a power reduction. Therefore, since inoperability of both CEACs in one or two CPC channels does not affect the remaining CPC channels, it may be advantageous to declare the affected CPC channels inoperable and perform the LCO 3.3.1 Required Actions, rather than forcing a power reduction by performing Required Actions B.2.1 through B.2.6.

7. The existing provisions of Required Actions B.1, B.2, B.3, B.4, B.5, and B.6 are retained as Required Actions B.2.1, B.2.2, B.2.3, B.2.4, B.2.5, and B.2.6. The identical completion times are also retained.

   The new Required Action B.1 may be used to allow entry into LCO 3.3.1 on loss of both CEACs in up to four CPC channels. However, loss of both CEACs in one or more CPC channels does not render a CPC channel inoperable, though it does require performing existing Required Actions B.1 through B.6. Therefore, on loss of both CEACs in one or more channels, the existing provisions of B.1, B.2, B.3, B.4, B.5 and B.6 are retained as Required Actions B.2.1, B.2.2, B.2.3, B.2.4, B.2.5, and B.2.6.

8. Condition C, "Receipt of a Channel B or C cabinet high temperature alarm", and associated Required Action will be deleted.

   In the presently installed CPCS, each CPC channel is equipped with two cabinet temperature switches that provide remote annunciation on high cabinet temperature conditions. In the replacement CPCS there are two cabinet temperature sensing RTDs per channel, each providing an analog temperature input measurement to different analog input modules. The cabinet temperature input allows for display of existing cabinet temperature on the Operator's Module (OM) and Maintenance Test Panel (MTP). The CPC processor monitors the RTDs and compares the temperature against a high temperature alarm setpoint and provides a digital output to the cabinet temperature high annunciator and a channel trouble alarm indication on the OM and MTP. The cabinet temperature alarm setpoint of 122 degrees F is well below the 140 degree F temperature to which the CPCS was subjected to during environmental testing.

   The replacement CPCS possesses extensive online diagnostics to continuously monitor and assess channel functionality. These diagnostics address numerous failure conditions from many causes, temperature stress being only one such cause. Failures will be flagged by pertinent error messages and a channel trouble alarm on the OM and MTP, and provisions for remote annunciation on channel trouble. The nature of the failure can be diagnosed from these locations. Therefore, since channel functionality is monitored continuously, Condition C and the associated Required Action are no longer required.

9. Condition D, "One or two CEACs with three or more auto restarts during a 12 hour period", and associated Required Action will be deleted.

   In the presently installed CPCS, numerous failures result in an "auto restart" in which the CEAC processor attempts to reinitialize and return to operation following a failure condition (e.g., floating point arithmetic fault, divided by zero, etc.). If the restart is successful due to a spurious failure condition, the CEAC will resume normal operation. The cause of the failure is logged at the CPC OM. It is possible for a marginally performing CEAC channel processor to recover from repetitive failures. This Condition forces performance of a channel functional test if three or more such failure and restart conditions occur in a 24 hour period to assure the CEAC is reliable.

   The replacement CPCS has no such auto restart capability. A processor failure will result in a HALT condition, in which the CEAC processor remains in a failed state, the watchdog timer times out, and maintenance personnel must perform a restart or repair of the affected module. Any repair will result in appropriate diagnostics being performed on the module to assure operability. Therefore, Condition D and the associated Required Action are no longer required.

<u>LCO 3.3.3 Surveillance Requirement (SR) Changes</u>

1. SR 3.3.3.2, "Check the CEAC auto restart count", with a frequency of 12 hours will be deleted.

   The replacement CEAC does not have an auto restart feature. However, the CPCS does possess an extensive diagnostic repertoire, including the ability to detect I/O mode failures, datalink failures, and numerous other failures. Several hundred potential failure conditions are monitored in this manner and will illuminate a channel trouble lamp on the OM and MTP, provide appropriate diagnostic messages on a system status display page, and provide remote annunciation when a failure is detected. The system status display consists of two separate displays:

   - The Systems Events List provides one or more pages of dynamic alarms and status information. This page includes all current diagnostic failures.

   - The System Event Log provides historical alarm and status information, including a logging of the previous thirty diagnostic system failures from the System Events List. This list is intended to provide a historical measure of system reliability, and as an aid in diagnosing intermittent failures.

   Because of the numerous redundant features in the new CPCS, including redundant input modules and data links, most of these failures will not in themselves cause CEAC inoperability.

   A failure rendering a CEAC inoperable, such as loss of both redundant CEA position inputs on four or more CEAs, will result in a CEAC fail lamp on the OM and MTP, and CEAC fail annunciation, as well as a CEAC Fail flag to the associated CPC processor. The CPC will respond to a CEAC failure in the same manner as the CPC in the existing system. Multiple module or data link failures resulting in a loss of function, as indicated by a CEAC fail or CEAC sensor fail, and those resulting only in channel trouble alarm and logging on the System Events List/System Events Log are to aid the operator in establishing channel operability. Since both CPC and CEAC modules are checked with SR 3.3.1.3, and CEACs serve to support operable CPCs, a redundant surveillance requirement similar to SR 3.3.1.3 provides no additional benefit and therefore can be deleted.

2. SR 3.3.3.6, "Verify the isolation characteristics of each CEAC isolation amplifier", will be deleted.

   This surveillance applies to the CEA Position Amplifier (CPIA) assemblies, which are eliminated in the replacement design. The CPIAs presently isolate analog CEA position transmission from CPC channel A to channel B and CPC channel D to channel C. In the replacement CPCS, CEA position undergoes analog to digital conversion in the originating channel, and is transmitted to other channels over one-way fiber-optically isolated high-speed links.

In summary, the Core Protection Calculator System at Palo Verde Nuclear Generating Station needs to be replaced due primarily to parts obsolescence. Arizona Public Service intends to replace the CPCS in all three Palo Verde units with a functionally equivalent, digital Common Qualified (or Common-Q) CPCS provided by Westinghouse Electric Power LLC (CE Nuclear Power LLC). The proposed amendment would support the upgrade of the CPCS while maintaining the same intent as that of the current CPCS related TS.

In support of this proposed amendment, changes to the TS Bases are provided in Attachment 4 as information only.

[Note: Due to PVNGS being a three-unit facility that shares a common TS Manual, and the scope of change to the LCOs, Conditions/Responses, and Surveillances being broad, there is a potential for confusion in implementing the pages for these changes. For the sake of human factors and efficiency, the format of this change will be to add duplicate LCO pages in support of this proposed amendment (i.e., post CPCS upgrade) after the pages of the current TS (i.e., pre CPCS upgrade). The new specifications, which would be maintained as additional pages, would be applicable for Units with the CPCS upgrade (i.e., fuel cycle 12 and beyond). The old specifications will continue to be applicable for Units with the existing CPCS (i.e., fuel cycle 11 and earlier). When all units have upgraded to the new Common Q CPCS (i.e., reached cycle 12), APS will submit a change to remove those pages related to the pre-upgrade CPC system that no longer apply.]

3.0 BACKGROUND

APS intends to replace the CPCS in all three units due primarily to parts obsolescence associated with existing equipment. All CPC and CEAC systems at PVNGS will be replaced with a functionally equivalent, digital Common Qualified (or Common-Q) CPCS provided by Westinghouse Electric Power LLC (CE Nuclear Power LLC).

As part of the Reactor Protection System (RPS), the CPCS helps effect reliable and rapid reactor shutdown (reactor trip) when the Departure from Nucleate Boiling Ratio (DNBR) or the Local Power Density (LPD) approach their specified limiting safety system settings. The reactor trips protect against violating core specified acceptable fuel design limits during anticipated operational occurrences. By tripping the reactor, the RPS also assists the Engineering Safety Features (ESF) Systems in mitigating accidents. The replacement CPCS will continue to meet these functional requirements.

Both the existing and replacement CPCS consist of four independent channels of equipment (A, B, C, and D) that are physically separated from each other and located in the auxiliary protective cabinets. The Core Protection Calculators (CPCs) generate pre-trip and trip signals on Low DNBR and High LPD, as well as CEA Withdrawal Prohibit (CWP) signals to the Plant Protection System (PPS). A reactor trip signal from RPS is generated when any two of the four CPCS channels generate a trip signal.

Both the existing and replacement CPCs utilize Control Element Assembly Calculators (CEACs) to obtain Control Element Assembly (CEA) position and generate appropriate "penalty factors" when CEAs deviate by more than a specific deadband limit within each subgroup. These penalty factors are used to modify CPC calculation results in a conservative manner which then may result in a reduction of margin to trip for low DNBR and high LPD. Each CEA position is measured by two redundant and independent Reed Switch Position Transmitters (RSPTs) associated with each CEA.

In the existing CPC/CEAC design, each RSPT provides an analog input to one of the two redundant CEACs. CEAC 1 is mounted in CPC channel B, and CEAC 2 is mounted in CPC channel C. CEAC 1 monitors the position of all CEAs based upon RSPT 1 CEA position input, and CEAC 2 performs an identical function, but based upon RSPT 2. CEAC penalty factor outputs in the existing system are transmitted to all four CPC channels over one-way isolated data links. Thus, the CPCs in all four channels receive penalty factor inputs from both CEACs.

In the replacement design, the disposition of CEA inputs to CEACs will be retained, but there will be eight CEACs, two in each CPC channel. Each CPC channel will have a CEAC 1, using RSPT 1 inputs from all CEAs, and a CEAC 2, using RSPT 2 inputs from all CEAs. RSPT inputs to each CPC/CEAC channel will be converted to digital format in the channel analog input module A/D converter, and transmitted to the other three CPC/CEAC channels via optically isolated data links. Increased availability should be achieved in the replacement design because the failure of a CEAC affects only the associated CPC channel. Additionally, for the Common Q platform, the failed module can be exchanged for a good one without removing power from the channel.

The replacement CPCS also includes four redundant Operator Modules (OMs), one per CPC/CEAC channel, located on the Main Control Room panels using Flat-Panel Display Systems (FPDS). The OM and CEA Position displays in the replacement system are significantly enhanced as compared to the existing system, providing better information formatting and the ability to display multiple Point IDs simultaneously. In the replacement CPCS there are also Maintenance and Test Panels (MTP) in each CPC/CEAC channel using FPDSs similar to that of the OM. They are used for diagnosing the system, providing electrically isolated communications to external systems, and displaying the same information as the OM. The MTP is local to the CPC processors and is the primary human machine interface for routine maintenance and surveillance testing by plant technicians.

Topical report CENPD-396-P, "Common Qualified Platform" (Ref. 1), describes the design, qualification, reliability, and commercial grade dedication of the Common Q platform including the CPCS and all subcomponents (e.g., CPC, CEAC, OM, MTP, CEA Position Display Monitor, etc.). CENPD-396-P was generically accepted by the NRC for application to nuclear power plants on August 11, 2000 (Ref. 2) subject to the satisfactory resolution of ten vendor related Generic Open Items (GOIs). Additionally, the NRC stipulated in section 6.0 of the Safety Evaluation (SE) that fourteen Plant-Specific Action Items (PSAIs) be performed by applicants requesting approval for installation of a Common Q system. These 14 PSAIs are addressed in section 4.2 of this submittal.

Subsequently, Westinghouse has submitted to the NRC for review an addendum (Ref. 9) to Appendix 2 of CENPD-396-P that addresses changes to the configuration of the individual CPCS modules that will be implemented at PVNGS. This addendum does not involve changes to the safety related algorithms described in topical report CENPD-396-P, "Common Qualified Platform" (Ref. 1).

In a phone call with the NRC on July 24, 2001, the NRC staff requested that information on the CPCS human factors review, electromagnetic/radio frequency interference (EMI/RFI), and Factory/Site Acceptance Testing (FAT/SAT) be discussed in this submittal. Human factor issues are discussed in response to Plant Specific Action Items (PSAIs) 6.7 and 6.14 in section 4.2 of this submittal. EMI/RFI concerns are discussed in response to PSAI 6.4. Finally, a discussion of FAT/SAT is outlined below:

FAT/SAT
Testing and analysis will be performed by Westinghouse leading up to the FAT. The hardware for the Common Q CPCS will undergo a FAT in accordance with Factory Acceptance Test procedures for the Common Q CPCS. All CPCS software functions are certified in the CPCS software qualification process. A comprehensive mapping of system requirements to system testing has been developed by Westinghouse in a Traceability Matrix for the Common Q Phase 3 CPCS Project.

Module and unit testing will be performed leading up to the FAT. In module testing, individual elements or groups of elements are tested using test cases developed from the existing CPCS Phase 1 testing, or are based on inputs calculated to exercise branches in the C Code. In unit testing, test cases are developed based on Phase 2 test cases used on the existing CPCS. In unit testing, the programs running in each processor (CPC, AUXCPC, CEAC and CPP) are tested by applying inputs and recording outputs using the High Speed Link (HSL) and the Single Channel Facility (SCF). The unit testing has a number of phases including "input sweep tests", "dynamic tests" and "live input tests". Westinghouse will also perform an analysis and actual testing of system response time.

The SAT will be split up into two phases, (pre and post installation). Testing prior to installation will be informal, repeating portions of the FAT, and some dry runs of the procedures that are written for Surveillance Tests and Preventative Maintenance. The testing following installation will be formal, and will follow the initial startup testing of the CPC system. The plans will include:

- verifying that installation occurred correctly by checking input and outputs of the system (field inputs and output contacts) and verifying that individual parameters read by CPCs agree with the readings from the Plant Monitoring System (PMS)
- performing the CPC Calibration and Functional Surveillance Tests
- verifying that calculated values, such as flow, are consistent between CPCs and PMS
- using a CPC simulation program after startup that calculates LPD and DNBR based on actual plant parameters and compares to CPC LPD and DNBR values
- performing a power calibration manually and comparing it to the automated version on CPCs

4.0 TECHNICAL ANALYSIS

4.1 Technical Analysis for TS Changes

The CPCS upgrade will require significant changes to LCO 3.3.1, Reactor Protective System (RPS) Instrumentation - Operating, and LCO 3.3.3, Control Element Assembly Calculators (CEACs). However, minor changes are also needed for LCO 3.2.4, Departure From Nucleate Boiling Ratio (DNBR). This will allow the TS to reflect the new CPCS design of eight CEACs (two per CPC channel) instead of the existing two CEACs total. Additionally, the proposed changes would take into account the improved performance and monitoring capability of the new CPCS over the existing. The proposed amendment would support the upgrade of the CPCS while maintaining the same intent as that of the current CPCS related TS.

As stated previously, topical report CENPD-396-P, "Common Qualified Platform" (Ref. 1), was generically accepted by the NRC for application to nuclear power plants on August 11, 2000 (Ref. 2) subject to the satisfactory resolution of ten vendor related Generic Open Items (GOIs). Additionally, the NRC stipulated that fourteen Plant-Specific Action Items (PSAIs) be performed by applicants requesting approval for installation of a Common Q system. These 14 PSAIs are addressed in Section 4.2 of this submittal. All GOIs have been or are being addressed by the vendor.

Hardware configuration changes proposed by Westinghouse in their addendum (Ref. 9) to Appendix 2 of CENPD-396-P are currently being reviewed by the NRC. As stated previously, this addendum does not involve changes to the safety related algorithms described in topical report CENPD-396-P, "Common Qualified Platform" (Ref. 1).

The Common Q replacement CPCS will run safety-related algorithms functionally identical to the existing CPCS with one enhancement to correct software deficiencies described below:

Reactor Power Cutback (RPCB) Algorithm

A Reactor Power Cutback System (RPCS) is used at PVNGS to drop selected CEAs into the core to reduce reactor power rapidly during a large loss of load or loss of a main feedwater pump. This allows other control systems to maintain the plant in a stable condition without a reactor trip, and without lifting any safety valves during loss of large load transients with the condenser available.

The RPCB algorithm in the existing CEAC program monitors CEA movement and position for indications of a RPCB event. If one or both RPCB-designated CEA Regulating Groups (lead groups 5 and 4) are observed to be dropping (and no other CEAs are dropping, thus distinguishing it from a normal reactor trip), the RPCB flag is set for a specified time delay. This duration is in seconds and is an addressable constant. This flag is transmitted to the CPCs and is used by the CPCs to delay application of increased radial peaking factors due to the lead group insertions. The algorithm is presently coded to accommodate dropping or bottomed CEAs.

During an event in 1991, lightning struck the Unit 3 main transformer causing a generator and turbine trip. This event was documented in Licensee Event Report (LER) 91-008-00 (Ref. 8). The RPCB system initiated the drop of Regulating Group 5. At this time the unit was exercising the option of selecting and dropping only the lead group. Subsequently, Regulating Group 4 was inserted into the core to further reduce reactor power. Approximately at the end of the first time delay, CEA subgroup 22 of Regulating Group 4 slipped approximately 11 inches causing a second time delay. Because CEA subgroup 22 was misaligned from the other subgroup in the group, a CPC DNBR trip was generated when the second time delay ended.

Review of the software indicated that a RPCB subgroup slipping could set the RPCB flag, but would not reset the flag when the slip stopped. This is a deficiency in the software and System Requirement Specifications (SysRS). As a compensatory action, the procedures were changed to require selecting both RPCB regulating groups such that an RPCB event would require both groups to fully insert. It is noted that if the subgroup were not part of the RPCB groups, the RPCB (time delay) flag would not have been set a second time.

Correcting this coding deficiency would result in the CEACs recognizing a slipped rod in group 5 or 4 during a reactor power cutback event, resetting the flag following identification of slippage prior to completion of the time delay, and preventing unnecessary delay in updating radial peaking factors and determining if a subgroup deviation or out of sequence CEA configuration exists.

Correcting this deficiency would also allow the units the option of selecting either one or both RPCB groups (manually or automatically). This change would restore the operation of the Reactor Power Cutback System to its fully intended function as described in section 7.7.1.1.6 of the Palo Verde Updated Final Safety Analysis Report (UFSAR). This would result in minimizing excessive power reductions for events that initiate a reactor power cutback when only one group is needed to stabilize the plant within the capability of other control systems [i.e., Steam Bypass Control System (SBCS) and Feedwater Control System (FWCS)] as intended.

The Common Q replacement CPCS will also have an additional operational change that will enhance restoration following a CEA Rate of Change lock-in described below:

CEA Rate of Change Lock-In

In the existing CPCS and when monitoring CEA positions, the CEAC program performs validity checks of the CEA input signal. These checks consist of 1) a range check to verify the CEA position is within the CEA operating band and 2) a rate of change check to verify CEA movement is reasonable.

The range check is a comparison of the CEA position to the lower and upper limit of the operating band and to lower and upper failed sensor setpoints, which are outside the operating band. If the CEA position is detected outside the failed sensor setpoints, the CEA is considered failed; but the failure can be automatically cleared if the position is detected inside the failed sensor setpoints.

The rate of change check is a comparison of the present CEA position with its position from the previous program execution (i.e., every 0.1 seconds). If this difference exceeds a preset limit (e.g., due to erratic RSPT indication), then the CEA sensor is considered failed, a CEA Sensor Failure alarm is activated, and the last good position is retained. In essence, this freezes or locks in the CEA's indicated position. If group movement were continued, and the affected CEA continued to move with its group, a pseudo CEA deviation could develop which (for 12-fingered CEAs) would result in a penalty being transmitted to the CPCs causing a CPC DNBR trip. The only options in the existing CPCS to clear this position lock is to either reverse movement of the group until all CEA positions in the group are indicating the same position (which may not be preferred if CEAs were moved for ASI control) or to stop CEA movement and call a technician to reboot the computer.

Correcting this coding deficiency in the replacement CPCS would allow the operators to manually reset the CEA position in the CEAC to the current good position (as validated by redundant position RSPT/Pulse Counter indication) without rebooting, thus reducing operational delays. There is no impact on DNBR and LPD. If the condition is due to the software lock-in, then continued group movement will create a deviation and generate a penalty. This would be a very conservative response. If the CEA position deviation is real, both CEACs will monitor it and respond accordingly.

The Common Q CPCS will continue to assure that the DNBR of the most limiting fuel assembly in the reactor core is greater than or equal to the minimum required. The Common Q CPCS will also continue to assure that the Local Power Density of the most limiting fuel assembly in the core does not exceed a value at which fuel centerline melting would occur for the list of design bases anticipated operational occurrences.

Chapter 15.0 of the PVNGS Updated Final Safety Analysis Report (UFSAR) presents analytical evaluations of the nuclear steam supply system (NSSS) response to postulated disturbances in process variables and to postulated malfunctions or failures of equipment. The assumptions for CPC performance, response time, and accuracy in Chapter 15.0 will continue to be met with the new system.

In summary, since the Common Q CPCS does not impact functionality of the CPCS, this proposed amendment would serve to reflect the Common Q CPCS design and maintain the same intent of the existing TS to assure that the lowest functional capability or performance level and the necessary quality of the CPCS is maintained.

4.2 <u>APS Response to NRC List of Plant Specific Action Items from the Safety Evaluation Report for CENPD 396-P</u>

The following information describes APS' response to the fourteen Plant Specific Action Items that the NRC outlined in their SE for CENPD 396-P, (Ref. 2). Since APS will only be implementing the CPCS portion of Common Q equipment, responses to PSAIs will be limited to discussion on just the CPCS to be installed.

Plant Specific Action Item 6.1
"Each licensee implementing a specific application based upon the Common Q platform must assess the suitability of the S600 I/O modules to be used in the design against its plant-specific input/output requirements. See Section 4.1.1.1.2. [of SE]."

APS Response to PSAI 6.1
The suitability of all new components are assessed to meet applicable requirements in accordance with the PVNGS Quality Assurance Program. Performance requirements for these components are assured, for example, by specifying them in purchase contracts, observing vendor testing and analysis, reviewing vendor documentation, performing design reviews by the engineering department, and by performing validation tests after installation. All these activities are controlled by PVNGS administrative procedures.

The Input/Output Subsystem incorporated as part of the design specification for the Common Q CPCS replacement has been designed to fully meet the functional requirements set forth in the System Requirements Specification (SysRS) for the Common Q Core Protection Calculator System. These requirements meet or exceed the equipment qualification requirements for PVNGS. The Input/Output subsystem will be deemed capable of performing its design function by successful completion of testing, culminating in a Factory Acceptance Test (FAT) to be performed by the vendor at the Westinghouse manufacturing/engineering facility. Acceptance criteria will be based on the SysRS. Environmental and seismic testing have already been successfully completed per Westinghouse test plans.

Plant Specific Action Item 6.2
"A hardware user interface that replicates existing plant capabilities for an application may be chosen by a licensee as an alternative to the FPDS. The review of the implementation of such a hardware user interface would be a plant-specific action item. See Section 4.1.2. [of SE]."

APS Response to PSAI 6.2
APS intends to use the Flat Panel Display System (FPDS) as developed by Westinghouse for the CPCS. An alternative hardware interface will not be used. Therefore, this action item is not applicable.

Plant Specific Action Item 6.3
"If a licensee installs a Common Q application that encompasses the implementation of FPDS, the licensee must verify that the FPDS is limited to performing display and maintenance functions only, and it is not to be used such that it is required to be operational when the Common Q system is called upon to initiate automatic safety functions. The use of

the FPDS must be treated in the plant specific FMEAs. See Section 4.2.1.2 [of SE]."

APS Response to PSAI 6.3
The FPDS to be purchased by APS will be limited to performing display and maintenance functions only. The plant specific Failure Mode Effects Analysis (FMEA) prepared in accordance with PSAI 6.10 will address the loss of the FPDS. Additionally, the NRC in their Safety Evaluation for the Closeout of Several of the Common Qualified Platform Category 1 Open Items Related to Reports CENPD-396-P, Revision 1 and CE-CES-195 Revision 1, dated June 22, 2001, (Ref. 3) has stated that this action item has been resolved and is considered closed. Therefore, no further evaluation is required.

Plant Specific Action Item 6.4
"Each licensee implementing a Common Q application must verify that its plant environmental data (i.e., temperature, humidity, seismic, and electromagnetic compatibility) for the location(s) in which the Common Q equipment is to be installed are enveloped by the environment considered for the Common Q qualification testing, and that the specific equipment configuration to be installed is similar to that of the Common Q equipment used for the tests. See Sections 4.2.2.1.1, 4.2.2.1.2, and 4.2.2.1.3 [of SE]."

"CENP configured the Common Q test specimen for seismic testing using dummy modules to fill all the used rack slots. As part of the verification of its plant-specific equipment configuration the licensee must check that it does not have any unfilled rack slots. See Section 4.2.2.1.2 [of SE]."

APS Response to PSAI 6.4 (4.2.2.1.1 - Temperature & Humidity)
The environmental conditions occurring in PVNGS control buildings consist of temperature, pressure and humidity conditions. CPCS equipment will be located in a mild (non-harsh) environment. Therefore, age related degradation is expected to be insignificant for temperature and humidity. The CPCS equipment (elevation 140' of control building) will be exposed to the following environmental conditions during the life of the plant.

Parameter	Normal Min.	Normal Max.	Duration	Abnormal Min.	Abnormal Max.	Duration
Temperature	65F	104F	Continuous	55F	122F	8 Hours
Humidity	40% RH	60% RH	Continuous	20% RH	90% RH	8 Hours
Pressure	Atmosph	Atmosph	Continuous	Atmosph	Atmosph	Continuous
Radiation	Negligible	Negligible	Continuous	Negligible	Negligible	Continuous

The Common Q CPCS has been environmentally qualified by Westinghouse for the environmental conditions described in the table below that result from abnormal conditions for which it must operate. No condensation formed on the test item during any phase of the testing.

Parameter	Abnormal Min.	Abnormal Max.	Duration
Temperature	40° F	140° F	12 Hours
Humidity	20% RH	95% RH	12 Hours
Pressure	Atmospheric	Atmospheric	Continuous

During anticipated abnormal transients/conditions, the essential HVAC system maintains the essential areas (control room, computer room and associated rooms at elevation 140') within normal design ambient temperature, pressure and humidity conditions. Therefore, the environmental conditions do not increase above normal design conditions as a result of anticipated abnormal transients/conditions.

Based on the above, the environment considered for the Common Q qualification testing envelopes the specific PVNGS temperature and humidity conditions.

APS Response to PSAI 6.4 (4.2.2.1.2 - Seismic Testing)

The seismic qualification of the Common Q Equipment for PVNGS has been completed by Westinghouse. APS has evaluated the Required Response Spectra (RRS) cited in the Westinghouse Seismic Test Plan for OBE, SSE, and Table Limits and has determined that they are significantly higher than the PVNGS floor response spectra curves documented in the Palo Verde Equipment Qualification Program Manual for the area where the CPC/CEAC system will be installed (140 ft control building) and therefore, envelopes the seismic criteria for PVNGS.

The dummy modules populating the unused chassis slots during seismic testing are essentially the outer cases and front faces of modules similar in size and appearance to the active modules, but lacking the internal electronics and associated hardware.

Installation of the Common Q CPCS hardware at PVNGS will include dummy modules in unused chassis slots. Plant modification documents used for implementing the Common Q CPCS at PVNGS will specify this requirement. PVNGS administrative procedures, which ensure equipment qualifications (e.g., seismic, etc) are maintained in the design change process, will control all future changes to the CPCS.

APS Response to PSAI 6.4 (4.2.2.1.3 - EMI/RFI)
Westinghouse is performing specific EMI/RFI tests on the CPCS equipment in accordance with EPRI TR-102323, Guidelines for Electromagnetic Interference Testing in Power Plants, Revision 1 (Ref. 6). The test data collected by Westinghouse will be compared to NUREG/CR-6431 (Ref. 7) and Palo Verde's EMI/RFI Engineering study by Palo Verde Engineering. These comparisons will verify that new CPCS will not be affected by the existing EMI/RFI environment. These comparisons will also verify that the new CPCS will not introduce EMI/RFI at levels that would affect surrounding equipment.

Plant Specific Action Item 6.5
"On the basis of its review of the CENP's software development process for application software, the staff concludes that the SPM specifies plans that will provide a quality software life cycle process, and that these plans commit to documentation of life cycle activities that will permit the staff or others to evaluate the quality of design features upon which the safety determination will be based. The staff will review the implementation of the life cycle process and the software life cycle process design outputs for specific applications on a plant specific basis. See Section 4.3.2 [of SE]."

APS Response to PSAI 6.5
In accordance with the PVNGS Quality Assurance Program, APS uses administrative control procedures to establish software quality assurance and configuration management for process computer software, firmware and associated software development computer systems, and associated documentation. They ensure that the integrity of a process software product is known and preserved throughout its life cycle (from development to retirement). These controls also apply to the development tools and systems used to develop and test process software.

As is already required by administrative control procedures, APS will maintain documentation of the Common Q CPC Software Life Cycle Process provided by Westinghouse for both the Implementation Activities and the required Design Outputs. This documentation is for internal use and to allow for the NRC staff review. This documentation will include life cycle process documentation provided by Westinghouse (i.e. Safety Analysis Activities, V&V plans, V&V results, Testing Results) as well as installation test activities performed and documented by APS in accordance with Plant Modification Processes. It should be noted that APS does not intend to have a group analogous to a Configuration Control Board as mentioned in section

3.2 of BTP HICB-14 (Guidance on Software Reviews for Digital Computer-Base Instrumentation and Control Systems).

Per procedural requirements, APS also maintains the requirements documents provided by Westinghouse (i.e. Functional Design Requirements, System Requirements Specifications, Software Requirements Specifications), design output documents (i.e. Software Design Descriptions, system build, configuration documents and code listings associated with the system) as well as Training and Maintenance Manuals.

Plant Specific Action Item 6.6
"When implementing a Common Q safety system (i.e. PAMS, CPCS, or DPPS), the licensee must review CENP's timing analysis and validation tests for that Common Q system in order to verify that it satisfies its plant specific requirements for accuracy and response time presented in the accident analysis in Chapter 15 of the safety analysis report. See Sections 4.1.1.4, 4.4.1.3, 4.4.2.3, and 4.4.3.3 [of SE]."

<u>APS Response to PSAI 6.6 (4.1.1.4 - Throughput & Response Time, and 4.4.2.3 - CPCS Evaluation)</u>
The acceptable response times for the CPCS are those given in the Updated Final Safety Analysis Report (UFSAR), Table 7.2-4AA (Reactor Protective Instrumentation Response Times), for the Local Power Density – High (I.A.8) and DNBR – Low (I.A.9). These are the response times used in the accident analyses in Chapter 15 of the UFSAR. Westinghouse (CENP) will perform a plant-specific analysis of the program timing (CPCS Timing Analysis). In addition, response time testing will be performed as part of the CPCS Factory Acceptance Test (FAT) on each system to be installed at Palo Verde. APS will review Westinghouse test results to ensure plant specific requirements for accuracy and response time as presented in the accident analysis in Chapter 15 of the PVNGS safety analysis report have been met.

Plant Specific Action Item 6.7
"The OM and the MTP provide the human machine interface for the Common Q platform. Both the OM and MTP will include display and diagnostic capabilities unavailable in the existing analog safety systems. The Common Q design provides means for access control to software and hardware such as key switch control, control to software media, and door key locks. The human factors considerations for specific applications of the Common Q platform will be evaluated on a plant-specific basis. See Sections 4.4.1.3, 4.4.2.3, 4.4.3.3, and 4.4.4.3.6 [of SE]."

APS Response to PSAI 6.7 (4.4.2.3 - CPCS Evaluation)
As required by PVNGS Plant Modification procedures, the CPC Replacement Project will receive a Human Factors (HF) Review in accordance with applicable NUREG 0700, Human-System Interface Design Review Guideline, criteria prior to the system being placed in service and made operable. The HF Review will focus on design features and characteristics of the new CPC system to ensure that the system incorporates acceptable human factors engineering principles and that the system provides the necessary system information, control capabilities, feedback, and analytical aids necessary for control room operators to accomplish their functions effectively. To support a smooth transition to the new system, the Operator's Module will include a 'Standard Display' that will mimic the existing remote Operator's Module.

Plant Specific Action Item 6.8
"If the licensee installs a Common Q PAMS, CPCS or DPPS, the licensee must verify on a plant-specific basis that the new system provides the same functionality as the system that is being replaced, and meets the functionality requirement applicable to those systems. See Sections 4.4.1.3, 4.4.2.3, and 4.4.3.3 [of SE]."

APS Response to PSAI 6.8 (4.4.2.3 - CPCS Evaluation)
As part of the normal design change process at Palo Verde the suitability of all new systems is assessed. This review covers the overall function of the system, as well as the design and licensing basis of the system. The Purchase Specifications for the CPC/CEAC System Replacement details the conditions of service and general requirements that must be met in the Common Q CPCS. These specifications detail the necessary performance requirements to assure functionality is maintained with the new system.

Enhancements to the CPCS are occurring as part of the Common Q design evaluation process for Palo Verde. In every case, performance requirement factors are being taken into account to ensure that the new CPCS will provide the same functionality as the CPCS being replaced.

Plant Specific Action Item 6.9
"Modifications to plant procedures and/or TS due to the installation of a Common Q safety system will be reviewed by the staff on a plant-specific basis. Each licensee installing a Common Q safety system shall submit its plant-specific request for license amendment with attendant justification. See Sections 4.4.1.3, 4.4.2.3, and 4.4.3.3 [of SE]."

APS Response to PSAI 6.9 (4.4.2.3 - CPCS Evaluation)
As part of the normal design change process at Palo Verde, the impact to plant procedures and TS is evaluated for all design changes. Plant procedures have been preliminarily reviewed and changes identified. All procedure changes will be evaluated in accordance with 10 CFR 50.59 requirements prior to implementation.

This license amendment request outlines the impact to the PVNGS TS and Bases that support implementation of the Common Q digital CPCS provided by Westinghouse. Justification for changes to the TS are included in this amendment request.

Plant Specific Action Item 6.10
"A licensee implementing any Common Q applications (i.e., PAMS, CPCS, or DPPS) must prepare its plant specific model for the design to be implemented and perform the FMEA for that application. See Sections 4.4.1.3, 4.4.2.3, 4.4.3.3, and 5.0 [of SE]."

APS Response to PSAI 6.10 (4.4.2.3 - CPCS Evaluation, and 5.0 - Summary of Regulatory Compliance Evaluations)
A plant specific FMEA for the Palo Verde CPCS, similar to one in the Westinghouse Common Q CPC topical report (Ref. 1), has been prepared. The results will be summarized in the Failure Modes and Effects Analysis, Table 7.2-4A, of the Palo Verde FSAR in accordance with the requirements of 10 CFR 50.71(e). In general there have been no changes in the way that the CPC and CEAC respond to input failures. This FMEA confirms that no single failure associated with the replacement CPCS will defeat more than one of the four protective channels, assuring proper protective action at the system level.

Plant Specific Action Item 6.11
"If a licensee installs Common Q PAMS, CPCS, DPPS or Integrated Solution, the licensee shall demonstrate that the plant-specific Common Q application complies with the criteria for defense against common-mode failure in digital instrumentation and control system and meets the requirements of HICB BTP-19. See Sections 4.1.6, 4.4.2.3, 4.4.3.3, 4.4.4.3.3, and 5.0 [of SE]."

APS Response to PSAI 6.11 (4.1.6 - Defense-in-Depth and Diversity)
The replacement CPCS is the first application of Common Q hardware at Palo Verde. There are no plans at this time to replace any of the non-safety plant control systems with Asea Brown Boveri (ABB) computer technology. Therefore, there is no potential to reduce the diversity or defense in depth of the Palo Verde systems related to Common Q.

In Supplement 1 to the Safety Evaluation Report issued to ANO-2 (NUREG 0308), the first plant with digital CPCs, the diversity of the Core Protection Calculators was evaluated, and found to be acceptable. ANO-2 SER Appendix D, Supplement 1, "Design Basis" (Ref. 5) states the following:

"Because the core protection calculator system (CPCS) is a first of a kind design, the staff considered failure of the CPCS to perform its normal function. Backup trips and normal shutdown mechanisms were reviewed to assess the depth of protection provided. This extent of this review is beyond that normally performed for reactor protection systems.

The CPCS provide the initial, but not the only trip, for the steam line break accidents, reactor coolant pump shaft seizure and steam generator tube rupture. Increased fuel damage could occur for the above accidents with concurrent failure of the CPCS. However, analog backup trips on system pressure...are available to provide reactor shutdown and mitigate the consequences of accidents. Failure of the CPCS, concurrent with any of the above incidents, is an extremely unlikely event."

"Backup trips are available to limit the consequences of each of the above events, even with failure of the CPCS, except the CEA misoperation event.

The CPCS provides a reactor trip for CEA deviation events where DNBR or peak linear heat rate limits are approached. Automatic reactor trips have not been provided in previous Combustion Engineering protection system designs for this event. In the unlikely event that a CEA deviation event which required a reactor trip occurred without a CPC initiated trip, the operator would get alarms from the core operating limit supervisory system (COLSS) on CEA position and flux tilt similar to that in non-CPCS plants. Manual trip could then be initiated."

"The staff has considered failure of the digital trip system to perform its design function. Backup analog trips and/or inherent shutdown mechanisms limit the consequences of this type of failure for all but the CEA misoperation events. For CEA misoperation, a manual trip, similar to previous plants, is required but numerous alarms and indications are available to inform the operator of the event.
We find the backup to the CPCS to be acceptable."

Diversity issues associated with replacement of the CPC channels with a common qualified platform-based system are acceptable based upon the following:

- Palo Verde possesses an almost identical backup set of hardware-implemented RPS trip functions as ANO-2.

- Palo Verde RPS trips are identical with the exception that Palo Verde also has Low Flow RPS trip based on Steam Generator primary side differential pressure. This trip is used to provide sheared shaft event protection, but would serve as a backup for any loss of flow event, including a seized RCP shaft.

- Replacement of the four CPC channel hardware with a common qualified platform represents a digital to digital upgrade of the Palo Verde CPC system. Licensing of this system addressed diversity issues by assuming a common cause failure of all four CPC channels. As noted in the Safety Evaluation Report issued to ANO-2 on the CPC channels, the NRC found the backup analog trips, inherent shutdown mechanisms, and provisions for manual operator action acceptable.

APS Response to PSAI 6.11 (Section 4.4.2.3 - CPCS Evaluation)
The replacement CPCS is the first application of Common Q hardware at Palo Verde. The original ESFAS system has not been upgraded from its original equipment (it has some 1970's vintage digital components that are limited to discrete logic gates and related elements, but it is not a Common Q based system). The ESFAS does not employ digital computers or software. Therefore, the failure case involving a common mode failure of all CPCS channels is not changed. The Palo Verde specific FMEA will be very similar to the generic FMEA proposed by Westinghouse for this area.

Plant Specific Action Item 6.12
"A licensee implementing a Common Q DPPS shall define a formal methodology for overall response time testing. See Section 4.4.3.3 [of SE]."

APS Response to PSAI 6.12
This plant specific action item is not applicable since Palo Verde is not proposing implementing a Common Q Digital Plant Protection System (DPPS) at this time.

Plant Specific Action Item 6.13
"The analysis of the capacity of the shared resources to accommodate the load increase due to sharing. See Section 4.4.4.3.1 [of SE]."

APS Response to PSAI 6.13

The shared resource issue relates to multiple Common Q based systems (e.g., both CPC and PAMS) using the same resources (such as the AF100 bus or an Operator Module). The replacement CPCS is the first application of Common Q hardware at Palo Verde. Therefore this issue is not applicable at this time. Any future plant changes involving Common Q (such as PPS, ESFAS, RPS or PAMS) will require this analysis for the resources that would actually be shared.

Plant Specific Action Item 6.14

"The licensee must ascertain that the implementation of the Common Q does not render invalid any of the previously accomplished TMI action items. See Section 5.0 [of SE]."

APS Response to PSAI 6.14

TMI action items from 50.34(f)(2) that are relevant to the PVNGS implementation of a new CPCS are as follows:

- 50.34(f)(2)(i) - Provide simulator capability that correctly models the control room and includes the capability to simulate small-break LOCA's.
- 50.34(f)(2)(iii) - Provide, for Commission review, a control room design that reflects state-of-the-art human factor principles prior to committing to fabrication or revision of fabricated control room panels and layouts.

In regards to the Simulators used to train PVNGS Licensed Operators, each simulator is designed to correctly model the Unit Control Rooms (with some minor differences to accommodate unit differences) including the capability to simulate small-break LOCAs. As required by plant procedure, APS will be purchasing CPC systems for each of the two simulators that will correctly model the CPC version being placed in each of the Unit control rooms.

In regards to Human Factors, and as stated before, the CPC Replacement Project, as required by plant procedures, will receive a Human Factors (HF) Review in accordance with applicable NUREG 0700, Human-System Interface Design Review Guideline, criteria prior to the system being placed in service and made operable. The HF Review will focus on design features and characteristics of the new CPC system to ensure that the system incorporates acceptable human factors engineering principles and that the system provides the necessary system information, control capabilities, feedback, and analytical aids necessary for control room operators to accomplish their functions effectively.

Therefore, the CPCS implementation at PVNGS does not render invalid any of the previously accomplished TMI action items.

Likewise, the new CPCS will not render invalid any other of the plant's previously accomplished protection or safety functions. The CPCS design function will remain the same as the existing. The Common Q CPCS will continue to provide Reactor Protection System (RPS) trips on Low Departure from Nucleate Boiling Ratio (DNBR) and High Local Power Density (LPD) in response to calculations involving several input variables. It will also continue to provide a Control Element Assembly Withdrawal Prohibit (CWP) signal to the Plant Protection System (PPS). The CPCS does not directly interface with any other protection or safety function.

5.0 REGULATORY SAFETY ANALYSIS

5.1 No Significant Hazards Consideration

Arizona Public Service Company (APS) has evaluated whether or not a significant hazards consideration is involved with the proposed amendment(s) by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

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

Response: No.

The Core Protection Calculator System (CPCS) is being replaced due primarily to parts obsolescence. The replacement CPCS will perform functionally identical safety-related algorithms as the existing CPCS but on a newer platform. The CPCS design function will remain unchanged.

The physical location of the replacement CPCS will be the same as the existing CPCS in the auxiliary protective cabinets. Installation will occur during refueling outages when the system is not required for service. Majority of the testing will be performed prior to installation.

The CPCS is not an initiator of any analyzed accident, but is used for mitigation of a large number of anticipated operational occurrences and a small number of accidents. Since the CPCS is not an accident initiator, and the replacement CPCS is functionally unchanged, the CPCS replacement will not increase the probability of an accident.

The functionality of the existing CPCS safety related algorithms are replicated in the System Requirements Specification for the Common Q Core Protection Calculator System. The basic Common Q CPCS design concept was approved by NRC Safety Evaluation (SE), Acceptance For Referencing Of Topical Report CENPD-396-P, Rev. 01, "Common Qualified Platform" and Appendices 1, 2, 3 and 4, Rev. 01, dated August 11, 2000 (Ref. 2), and there have been no significant functional changes to the design as presented. The requirements for response time and accuracy that are assumed in the Palo Verde Nuclear Generating Station (PVNGS) Updated Final Safety Analysis Report (UFSAR) accident analysis will continue to be met. Therefore, since the new CPCS will be capable of performing the same safety-related functions within the same response time and accuracy as the existing CPCS, the proposed change does not involve a significant increase in the consequences of an accident previously evaluated.

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

Response: No.

The CPCS provides a monitoring and detection function and is not an initiator for any accident. The CPCS provides Reactor Protection System (RPS) trips on Low Departure from Nucleate Boiling Ratio (DNBR) and High Local Power Density (LPD) in response to calculations involving several input variables. It also provides a Control Element Assembly Withdrawal Prohibit (CWP) signal to the Plant Protection System (PPS), and provides indication and annunciation. The CPCS performs no other plant functions, and is not used to initiate any ESF functions. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

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

Response: No.

The CPCS is a replacement for the existing CPCS. It will retain the same safety-related functionality as the existing CPCS. The equipment will be qualified in accordance with requirements described in the Palo Verde UFSAR.

The replacement CPCS will perform functionally identical safety-related algorithms as the existing CPCS, will trip in response to the same inputs with equivalent accuracy, and will meet the same four channel separation requirements. The only significant area of difference involves the platform. The Common Q platform uses a consistent set of qualified building blocks (Advant Controllers, Flat Panel Displays, Power Supplies, and Communication Systems) that can be used for any safety system application. For Palo Verde purposes, the only application of this platform at this time will be for use as a CPCS. The new platform will include improved human factors and fault tolerance within each CPCS channel.

In summary, the replacement CPCS performs the same functions as the existing CPCS, meets the qualification requirements of the existing CPCS, and meets the accuracy standards of the existing CPCS. Therefore, the proposed change does not involve a significant reduction in a margin of safety.

Based on the above, APS concludes that the proposed amendment(s) present 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.

5.2 Applicable Regulatory Requirements/Criteria

In the application for a license to operate a facility, 10 CFR 50.34(b)(6)(ii) requires that the following shall be part of the Updated Final Safety Analysis Report (UFSAR):

"Managerial and administrative controls to be used to assure safe operation. Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," sets forth the requirements for such controls for nuclear power plants and fuel reprocessing plants. The information on the controls to be used for a nuclear power plant or a fuel reprocessing plant shall include a discussion of how the applicable requirements of Appendix B will be satisfied."

In accordance with 10 CFR 50 Appendix B, a Quality Assurance Program, as outlined in chapter 17.2 of the Palo Verde UFSAR, is utilized by APS in designing, purchasing, fabricating, handling, shipping, storing, cleaning, erecting, installing, inspecting, testing, operating, maintaining, repairing, and modifying activities that affect the safety-related functions of structures, systems, and components.

As stated in the PVNGS Equipment Qualification Program,

"The design, specification and procurement of new, replacement, or reworked equipment and parts shall consider the specific requirements necessary to maintain the continued qualification of installed equipment and environmental performance requirements of any "new" equipment."

Also, it states,

> *"The qualification of new equipment and designs shall be verified prior to their installation in the plant."*

In accordance with the Palo Verde Quality Assurance Program, the qualification requirements involving the CPCS such as suitability, functionality, response time, environmental, seismic, electromagnetic/ radio interference, human factors, software life cycle, failure mode analysis, defense in depth and diversity analysis, and TMI action items are evaluated to ensure that the replacement CPCS meets or exceeds the original CPCS requirements.

All regulatory requirements applicable to the design of the replacement CPCS are addressed in both CENPD-396-P (Ref. 1) and in the NRC SE for CENPD-396-P (Ref. 2).

The requirements for Limiting Conditions for Operation and Surveillance Requirements to be included in the Technical Specifications (TS) are found in 10 CFR 50.36. As stated previously, the replacement Common Q CPCS is functionally equivalent to the existing CPCS. Similarly, the proposed TS are written to meet the same intent as the previous. Therefore, the lowest functional capability or performance levels of equipment required for safe operation of the facility will be retained in the proposed amendment. Likewise, Surveillance Requirements in the proposed amendment will continue to assure that the necessary quality of systems and components are maintained, that facility operation will be within safety limits, and that limiting conditions for operation will be met.

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 this amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

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 10CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environment impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 REFERENCES

Reference:

1. CENPD-396-P, Common Qualified Platform Topical Report, Revision 1, dated May 2000
2. Acceptance For Referencing Of Topical Report CENPD-396-P, Rev. 01, "Common Qualified Platform" and Appendices 1, 2, 3 and 4, Rev. 01, dated August 11, 2000
3. Safety Evaluation for the Closeout of Several of the Common Qualified Platform Category 1 Open Items Related to Reports CENPD-396-P, Revision 1, and CE-CES-195 Revision 1, dated June 22, 2001
4. EPRI Topical Report TR-102323, Guidelines for Electromagnetic Interference Testing in Power Plants, Revision 1
5. Supplement 1 to NUREG 0308, ANO-2 SER, dated June 10, 1978
6. EPRI TR-102323, Guidelines for Electromagnetic Interference Testing in Power Plants, Revision 1
7. NUREG/CR-6431, Recommended Electromagnetic Operating Envelopes for Safety Related I&C Systems in Nuclear Power Plants
8. 192-00762-JML/TRB/RKR, APS Letter to NRC "Licensee Event Report 91-008-00", Dated December 13, 1991.
9. Westinghouse Electric Company letter LTR-NRC-02-41, "Additional Information Regarding the Westinghouse Common Qualified Platform Application – August 2002," dated August 14, 2002, to the NRC

Precedent:

- None

Attachment 1

Proposed Technical Specification Pages (mark-up)

3.2 POWER DISTRIBUTION LIMITS

3.2.4 Departure From Nucleate Boiling Ratio (DNBR)

LCO 3.2.4 The DNBR shall be maintained by one of the following methods:

a. Maintaining Core Operating Limit Supervisory System (COLSS) calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR (when COLSS is in service, and either one or both Control Element Assembly Calculators (CEACs) are OPERABLE);

b. Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR decreased by the allowance specified in the COLR (when COLSS is in service and neither CEAC is OPERABLE);

c. Operating within the region of acceptable operation specified in the COLR using any OPERABLE Core Protection Calculator (CPC) channel (when COLSS is out of service and either one or both CEACs are OPERABLE); or

d. Operating within the region of acceptable operation specified in the COLR using any OPERABLE CPC channel (when COLSS is out of service and neither CEAC is OPERABLE).

APPLICABILITY: MODE 1 with THERMAL POWER > 20% RTP. *(Before CPC Upgrade)*

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. COLSS calculated core power not within limit.	A.1 Restore the DNBR to within limit.	1 hour

(continued)

ACTIONS (continued)

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

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.2.4.1	-------------------NOTE-------------------- 1. Only applicable when COLSS is out of service. With COLSS in service, this parameter is continuously monitored. 2. Not required to be performed until 2 hours after MODE 1 with THERMAL POWER > 20% RTP. --- Verify DNBR, as indicated on any OPERABLE DNBR channels, is within the limit of the COLR, as applicable.	2 hours
SR 3.2.4.2	Verify COLSS margin alarm actuates at a THERMAL POWER level equal to or less than the core power operating limit based on DNBR.	31 days

3.2 POWER DISTRIBUTION LIMITS

3.2.4 Departure From Nucleate Boiling Ratio (DNBR)

LCO 3.2.4 The DNBR shall be maintained by one of the following methods:

a. ***Core Operating Limit Supervisory System (COLSS) In Service:***

1. Maintaining ~~Core Operating Limit Supervisory System (~~COLSS~~)~~ calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR ~~(~~when ~~COLSS is in service, and either~~ ***at least*** one ~~or both~~ Control Element Assembly Calculator~~s~~ (CEAC~~s~~) ~~are~~ ***is*** OPERABLE~~)~~ ***in each OPERABLE Core Protection Calculator (CPC) channel; or***

~~b.~~ ***2.*** Maintaining COLSS calculated core power less than or equal to COLSS calculated core power operating limit based on DNBR decreased by the allowance specified in the COLR ~~(~~when ~~COLSS is in service and neither CEAC is OPERABLE)~~ ***the CEAC requirements of LCO 3.2.4.a.1 are not met.***

b. COLSS Out of Service:

~~c.~~ ***1.*** Operating within the region of acceptable operation specified in the COLR using any OPERABLE Core Protection Calculator (CPC) channel ~~(~~when ~~COLSS is out of service and either~~ ***at least*** one ~~or both~~ CEAC~~s~~ ~~are~~ ***is*** OPERABLE~~)~~ ***in each OPERABLE CPC channel;*** or

~~d.~~ ***2.*** Operating within the region of acceptable operation specified in the COLR using any OPERABLE CPC channel ***(with both CEACs inoperable)*** ~~(~~when ~~COLSS is out of service and neither CEAC is OPERABLE)~~ ***the CEAC requirements of LCO 3.2.4.b.1 are not met.***

APPLICABILITY: MODE 1 with THERMAL POWER > 20% RTP. ***(After CPC Upgrade)***

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. COLSS calculated core power not within limit.	A.1	Restore the DNBR to within limit.	1 hour

ACTIONS (continued)

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

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.2.4.1	-------------------NOTE-------------------- 1. Only applicable when COLSS is out of service. With COLSS in service, this parameter is continuously monitored. 2. Not required to be performed until 2 hours after MODE 1 with THERMAL POWER > 20% RTP. --- Verify DNBR, as indicated on any OPERABLE DNBR channels, is within the limit of the COLR, as applicable.	2 hours
SR 3.2.4.2	Verify COLSS margin alarm actuates at a THERMAL POWER level equal to or less than the core power operating limit based on DNBR.	31 days

3.3 INSTRUMENTATION

3.3.1 Reactor Protective System (RPS) Instrumentation – Operating

LCO 3.3.1 Four RPS trip and bypass removal channels for each Function in Table 3.3.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1-1. (Before CPC Upgrade)

ACTIONS

-----NOTE-----
Separate Condition entry is allowed for each RPS Function.

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One or more Functions with one automatic RPS trip channel inoperable.	A.1	Place channel in bypass or trip.	1 hour
	<u>AND</u>		
	A.2	Restore channel to OPERABLE status.	Prior to entering MODE 2 following next MODE 5 entry
B. One or more Functions with two automatic RPS trip channels inoperable.	B.1	--------NOTE-------- LCO 3.0.4 is not applicable. -------------------- Place one channel in bypass and the other in trip.	 1 hour

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One or more Functions with one automatic bypass removal channel inoperable.	C.1 Disable bypass channel.	1 hour
	OR	
	C.2.1 Place affected automatic trip channel in bypass or trip.	1 hour
	AND	
	C.2.2 Restore bypass removal channel and associated automatic trip channel to OPERABLE status.	Prior to entering MODE 2 following next MODE 5 entry
D. One or more Functions with two automatic bypass removal channels inoperable.	------------NOTE------------ LCO 3.0.4 is not applicable. ----------------------------	
	D.1 Disable bypass channels.	1 hour
	OR	
	D.2 Place one affected automatic trip channel in bypass and place the other in trip.	1 hour
E. One or more core protection calculator (CPC) channels with a cabinet high temperature alarm.	E.1 Perform CHANNEL FUNCTIONAL TEST on affected CPC.	12 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
F. One or more CPC channels with three or more autorestarts during a 12 hour period.	F.1	Perform CHANNEL FUNCTIONAL TEST on affected CPC.	24 hours
G. Required Action and associated Completion Time not met.	G.1	Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

-----------------------------------NOTE-----------------------------------
Refer to Table 3.3.1-1 to determine which SR shall be performed for each RPS Function.

SURVEILLANCE		FREQUENCY
SR 3.3.1.1	Perform a CHANNEL CHECK of each RPS instrument channel.	12 hours

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.2	-------------------NOTE------------------- Not required to be performed until 12 hours after THERMAL POWER ≥ 70% RTP. -- Verify total Reactor Coolant System (RCS) flow rate as indicated by each CPC is less than or equal to the RCS total flow rate. If necessary, adjust the CPC addressable constant flow coefficients such that each CPC indicated flow is less than or equal to the RCS flow rate.	12 hours
SR 3.3.1.3	Check the CPC autorestart.	12 hours

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.4	-------------------NOTES----------------- 1. Not required to be performed until 12 hours after THERMAL POWER ≥ 20% RTP. 2. The daily calibration may be suspended during PHYSICS TESTS, provided the calibration is performed upon reaching each major test power plateau and prior to proceeding to the next major test power plateau. --- Perform calibration (heat balance only) and adjust the linear power level signals and the CPC addressable constant multipliers to make the CPC ΔT power and CPC nuclear power calculations agree with the calorimetric, if the absolute difference is ≥ 2% when THERMAL POWER is ≥ 80% RTP. Between 20% and 80% RTP the maximum difference is -0.5% to 10%.	24 hours
SR 3.3.1.5	-------------------NOTE------------------- Not required to be performed until 12 hours after THERMAL POWER ≥ 70% RTP. -- Verify total RCS flow rate indicated by each CPC is less than or equal to the RCS flow determined either using the reactor coolant pump differential pressure instrumentation and the ultrasonic flow meter adjusted pump curves or by calorimetric calculations.	31 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.6	-------------------NOTE------------------- Not required to be performed until 12 hours after THERMAL POWER ≥ 15% RTP. -- Verify linear power subchannel gains of the excore detectors are consistent with the values used to establish the shape annealing matrix elements in the CPCs.	31 days
SR 3.3.1.7	-------------------NOTES------------------- 1. The CPC CHANNEL FUNCTIONAL TEST shall include verification that the correct values of addressable constants are installed in each OPERABLE CPC. 2. Not required to be performed for logarithmic power level channels until 2 hours after reducing logarithmic power below 1E-4% NRTP. -- Perform CHANNEL FUNCTIONAL TEST on each channel.	92 days
SR 3.3.1.8	-------------------NOTE------------------- Neutron detectors are excluded from the CHANNEL CALIBRATION. -- Perform CHANNEL CALIBRATION of the power range neutron flux channels.	92 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.9	------------------NOTE------------------ Neutron detectors are excluded from CHANNEL CALIBRATION. --- Perform CHANNEL CALIBRATION on each channel, including bypass removal functions.	18 months
SR 3.3.1.10	Perform a CHANNEL FUNCTIONAL TEST on each CPC channel.	18 months
SR 3.3.1.11	Using the incore detectors, verify the shape annealing matrix elements to be used by the CPCs.	Once after each refueling prior to exceeding 70% RTP
SR 3.3.1.12	Perform a CHANNEL FUNCTIONAL TEST on each automatic bypass removal function.	Once within 92 days prior to each reactor startup
SR 3.3.1.13	------------------NOTE------------------ Neutron detectors are excluded. --- Verify RPS RESPONSE TIME is within limits.	18 months on a STAGGERED TEST BASIS

Table 3.3.1-1 (page 1 of 3)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Variable Over Power	1,2	SR 3.3.1.1 SR 3.3.1.4 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.8 SR 3.3.1.9 SR 3.3.1.13	Ceiling ≤ 111.0% RTP Band ≤ 9.9% RTP Incr. Rate ≤ 11.0%/min RTP Decr. Rate > 5%/sec RTP
2. Logarithmic Power Level – High[(a)]	2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≤ 0.011% NRTP
3. Pressurizer Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 2388 psia
4. Pressurizer Pressure – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≥ 1821 psia
5. Containment Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 3.2 psig
6. Steam Generator #1 Pressure – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 890 psia
7. Steam Generator #2 Pressure – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 890 psia

(continued)

(a) Trip may be bypassed when logarithmic power is > 1E-4% NRTP. Bypass shall be automatically removed when logarithmic power is ≤ 1E-4% NRTP.

Table 3.3.1-1 (page 2 of 3)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
8. Steam Generator #1 Level – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 43.7%
9. Steam Generator #2 Level – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 43.7%
10. Steam Generator #1 Level – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 91.5%
11. Steam Generator #2 Level – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 91.5%
12. Reactor Coolant Flow, Steam Generator #1-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	Ramp: ≤ 0.115 psid/sec. Floor: ≥ 12.49 psid Step: ≤ 17.2 psid
13. Reactor Coolant Flow, Steam Generator #2-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	Ramp: ≤ 0.115 psid/sec. Floor: ≥ 12.49 psid Step: ≤ 17.2 psid

(continued)

Table 3 3 1-1 (page 3 of 3)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
14. Local Power Density – High(b)	1,2	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.5 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≤ 21.0 kW/ft
15. Departure From Nucleate Boiling Ratio (DNBR) – Low(b)	1,2	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.5 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≥ 1.3 (through operating cycle 10) ≥ 1.34 (operating cycle 11 and later)

(b) Trip may be bypassed when logarithmic power is < 1E-4% NRTP. Bypass shall be automatically removed when logarithmic power is ≥ 1E-4% NRTP.

3.3 INSTRUMENTATION

3.3.1 Reactor Protective System (RPS) Instrumentation – Operating

LCO 3.3.1 Four RPS trip and bypass removal channels for each Function in Table 3.3.1-1 shall be OPERABLE.

APPLICABILITY: According to Table 3.3.1-1. (After CPC Upgrade)

ACTIONS

------------------------------------NOTE------------------------------------
Separate Condition entry is allowed for each RPS Function.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or more Functions with one automatic RPS trip channel inoperable.	A.1 Place channel in bypass or trip. AND A.2 Restore channel to OPERABLE status.	1 hour Prior to entering MODE 2 following next MODE 5 entry
B. One or more Functions with two automatic RPS trip channels inoperable.	B.1 --------NOTE--------- LCO 3.0.4 is not applicable. --------------------- Place one channel in bypass and the other in trip.	 1 hour

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. One or more Functions with one automatic bypass removal channel inoperable.	C.1 Disable bypass channel.	1 hour
	OR	
	C.2.1 Place affected automatic trip channel in bypass or trip.	1 hour
	AND	
	C.2.2 Restore bypass removal channel and associated automatic trip channel to OPERABLE status.	Prior to entering MODE 2 following next MODE 5 entry
D. One or more Functions with two automatic bypass removal channels inoperable.	------------NOTE------------ LCO 3.0.4 is not applicable. ----------------------------	
	D.1 Disable bypass channels.	1 hour
	OR	
	D.2 Place one affected automatic trip channel in bypass and place the other in trip.	1 hour
~~E. One or more core protection calculator (CPC) channels with a cabinet high temperature alarm.~~	~~E.1 Perform CHANNEL FUNCTIONAL TEST on affected CPC.~~	~~12 hours~~

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
~~F. One or more CPC channels with three or more autorestarts during a 12 hour period.~~	~~F.1 Perform CHANNEL FUNCTIONAL TEST on affected CPC.~~	~~24 hours~~
~~G~~ *E*. Required Action and associated Completion Time not met.	~~G~~ *E*.1 Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

------------------------------------NOTE------------------------------------
Refer to Table 3.3.1-1 to determine which SR shall be performed for each RPS Function.

SURVEILLANCE		FREQUENCY
SR 3.3.1.1	Perform a CHANNEL CHECK of each RPS instrument channel.	12 hours

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.2	-------------------NOTE------------------ Not required to be performed until 12 hours after THERMAL POWER ≥ 70% RTP. --- Verify total Reactor Coolant System (RCS) flow rate as indicated by each CPC is less than or equal to the RCS total flow rate. If necessary, adjust the CPC addressable constant flow coefficients such that each CPC indicated flow is less than or equal to the RCS flow rate.	12 hours
SR 3.3.1.3	Check the CPC ~~autorestart count~~ ***System Event Log.***	12 hours

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.3.1.4	-------------------NOTES------------------ 1. Not required to be performed until 12 hours after THERMAL POWER ≥ 20% RTP. 2. The daily calibration may be suspended during PHYSICS TESTS, provided the calibration is performed upon reaching each major test power plateau and prior to proceeding to the next major test power plateau. -- Perform calibration (heat balance only) and adjust the linear power level signals and the CPC addressable constant multipliers to make the CPC ΔT power and CPC nuclear power calculations agree with the calorimetric, if the absolute difference is ≥ 2% when THERMAL POWER is ≥ 80% RTP. Between 20% and 80% RTP the maximum difference is -0.5% to 10%.	24 hours
SR 3.3.1.5	-------------------NOTE-------------------- Not required to be performed until 12 hours after THERMAL POWER ≥ 70% RTP. -- Verify total RCS flow rate indicated by each CPC is less than or equal to the RCS flow determined either using the reactor coolant pump differential pressure instrumentation and the ultrasonic flow meter adjusted pump curves or by calorimetric calculations.	31 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.1.6	------------------NOTE------------------ Not required to be performed until 12 hours after THERMAL POWER ≥ 15% RTP. -- Verify linear power subchannel gains of the excore detectors are consistent with the values used to establish the shape annealing matrix elements in the CPCs.	31 days
SR 3.3.1.7	------------------NOTES------------------ 1. The CPC CHANNEL FUNCTIONAL TEST shall include verification that the correct values of addressable constants are installed in each OPERABLE CPC. 2. Not required to be performed for logarithmic power level channels until 2 hours after reducing logarithmic power below 1E-4% NRTP. -- Perform CHANNEL FUNCTIONAL TEST on each channel.	92 days
SR 3.3.1.8	------------------NOTE------------------ Neutron detectors are excluded from the CHANNEL CALIBRATION. -- Perform CHANNEL CALIBRATION of the power range neutron flux channels.	92 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.3.1.9	------------------NOTE------------------ Neutron detectors are excluded from CHANNEL CALIBRATION. -- Perform CHANNEL CALIBRATION on each channel, including bypass removal functions.	18 months
SR 3.3.1.10	Perform a CHANNEL FUNCTIONAL TEST on each CPC channel.	18 months
SR 3.3.1.11	Using the incore detectors, verify the shape annealing matrix elements to be used by the CPCs.	Once after each refueling prior to exceeding 70% RTP
SR 3.3.1.12	Perform a CHANNEL FUNCTIONAL TEST on each automatic bypass removal function.	Once within 92 days prior to each reactor startup
SR 3.3.1.13	------------------NOTE------------------ Neutron detectors are excluded. -- Verify RPS RESPONSE TIME is within limits.	18 months on a STAGGERED TEST BASIS

Table 3.3.1-1 (page 1 of 3)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Variable Over Power	1,2	SR 3.3.1.1 SR 3.3.1.4 SR 3.3.1.6 SR 3.3.1.7 SR 3.3.1.8 SR 3.3.1.9 SR 3.3.1.13	Ceiling ≤ 111.0% RTP Band ≤ 9.9% RTP Incr. Rate ≤ 11.0%/min RTP Decr. Rate > 5%/sec RTP
2. Logarithmic Power Level – High[(a)]	2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≤ 0.011% NRTP
3. Pressurizer Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 2388 psia
4. Pressurizer Pressure – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.12 SR 3.3.1.13	≥ 1821 psia
5. Containment Pressure – High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 3.2 psig
6. Steam Generator #1 Pressure – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 890 psia
7. Steam Generator #2 Pressure – Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 890 psia

(continued)

(a) Trip may be bypassed when logarithmic power is > 1E-4% NRTP. Bypass shall be automatically removed when logarithmic power is ≤ 1E-4% NRTP.

Table 3.3.1-1 (page 2 of 3)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
8. Steam Generator #1 Level - Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 43.7%
9. Steam Generator #2 Level - Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≥ 43.7%
10. Steam Generator #1 Level - High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 91.5%
11. Steam Generator #2 Level - High	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	≤ 91.5%
12. Reactor Coolant Flow, Steam Generator #1-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	Ramp: ≤ 0.115 psid/sec. Floor: ≥ 12.49 psid Step: ≤ 17.2 psid
13. Reactor Coolant Flow, Steam Generator #2-Low	1,2	SR 3.3.1.1 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.13	Ramp: ≤ 0.115 psid/sec. Floor: ≥ 12.49 psid Step: ≤ 17.2 psid

(continued)

Table 3.3.1-1 (page 3 of 3)
Reactor Protective System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
14. Local Power Density – High(b)	1,2	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.5 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≤ 21.0 kW/ft
15. Departure From Nucleate Boiling Ratio (DNBR) – Low(b)	1,2	SR 3.3.1.1 SR 3.3.1.2 SR 3.3.1.3 SR 3.3.1.4 SR 3.3.1.5 SR 3.3.1.7 SR 3.3.1.9 SR 3.3.1.10 SR 3.3.1.11 SR 3.3.1.12 SR 3.3.1.13	≥ 1.3 (through operating cycle 10) ≥ 1.34 (operating cycle 11 and later)

(b) Trip may be bypassed when logarithmic power is < 1E-4% NRTP. Bypass shall be automatically removed when logarithmic power is ≥ 1E-4% NRTP.

3.3 INSTRUMENTATION

3.3.3 Control Element Assembly Calculators (CEACs)

LCO 3.3.3 Two CEACs shall be OPERABLE.

APPLICABILITY: MODES 1 and 2. *(Before CPC Upgrade)*

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One CEAC inoperable.	A.1 Perform SR 3.1.5.1. AND A.2 Restore CEAC to OPERABLE status.	Once per 4 hours 7 days
B. Required Action and associated Completion Time of Condition A not met. OR Both CEACs inoperable.	B.1 Verify the departure from nucleate boiling ratio requirement of LCO 3.2.4, "Departure from Nucleate Boiling Ratio (DNBR)," is met. AND	4 hours (continued)

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. (continued)	B.2	Verify all full length and part length control element assembly (CEA) groups are fully withdrawn and maintained fully withdrawn, except during Surveillance testing pursuant to SR 3.1.5.3 or for control, when CEA group #5 may be inserted to a maximum of 127.5 inches withdrawn.	4 hours
	<u>AND</u>		
	B.3	Verify the "RSPT/CEAC Inoperable" addressable constant in each core protection calculator (CPC) is set to indicate that both CEACs are inoperable.	4 hours
	<u>AND</u>		
	B.4	Verify the Control Element Drive Mechanism Control System is placed in "STANDBY MODE" and maintained in "STANDBY MODE," except during CEA motion permitted by Required Action B.2.	4 hours
	<u>AND</u>		
	B.5	Perform SR 3.1.5.1.	Once per 4 hours
	<u>AND</u>		(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	B.6 Disable the Reactor Power Cutback System (RPCS)	4 hours
C. Receipt of a CPC channel B or C cabinet high temperature alarm.	C.1 Perform CHANNEL FUNCTIONAL TEST on affected CEAC(s).	12 hours
D. One or two CEACs with three or more auto restarts during a 12 hour period.	D.1 Perform CHANNEL FUNCTIONAL TEST on affected CEAC.	24 hours
E. Required Action and associated Completion Time of Condition B, C, or D not met.	E.1 Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.3.3.1 Perform a CHANNEL CHECK.	12 hours
SR 3.3.3.2 Check the CEAC auto restart count.	12 hours
SR 3.3.3.3 Perform a CHANNEL FUNCTIONAL TEST.	92 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.3.3.4	Perform a CHANNEL CALIBRATION.	18 months
SR 3.3.3.5	Perform a CHANNEL FUNCTIONAL TEST.	18 months
SR 3.3.3.6	Verify the isolation characteristics of each CEAC isolation amplifier.	18 months

3.3 INSTRUMENTATION

3.3.3 Control Element Assembly Calculators (CEACs)

LCO 3.3.3 Two CEACs shall be OPERABLE *in each CPC channel*

APPLICABILITY: MODES 1 and 2. *(After CPC Upgrade)*

ACTIONS

------------------------------NOTE------------------------------
Separate condition entry is allowed for each CPC channel.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One CEAC inoperable *in one or more CPC channels.*	*A.1* *Declare the affected CPC channel(s) inoperable.*	*Immediately*
	OR	
	~~A.1~~ *A.2.1* Perform SR 3.1.5.1.	Once per 4 hours
	AND	
	~~A.2~~ *A.2.2* Restore CEAC to OPERABLE status.	7 days
B. Required Action and associated Completion Time of Condition A not met. OR Both CEACs inoperable *in one or more CPC channels.*	B.1 *Declare the affected CPC channel(s) inoperable.*	*Immediately*
	OR	
		(continued)

ACTIONS *(continued)*

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	~~B.1~~ *B.2.1* Verify the departure from nucleate boiling ratio requirement of LCO 3.2.4, "Departure from Nucleate Boiling Ratio (DNBR)," is met.	4 hours
	AND	
	~~B.2~~ *B.2.2* Verify all full length and part length control element assembly (CEA) groups are fully withdrawn and maintained fully withdrawn, except during Surveillance testing pursuant to SR 3.1.5.3 or for control, when CEA group #5 may be inserted to a maximum of 127.5 inches withdrawn.	4 hours
	AND	
	~~B.3~~ *B.2.3* Verify the "RSPT/CEAC Inoperable" addressable constant in each *affected* core protection calculator (CPC) is set to indicate that both CEACs are inoperable.	4 hours
	AND	(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. (continued)	~~B.4~~ ***B.2.4*** Verify the Control Element Drive Mechanism Control System is placed in "STANDBY MODE" and maintained in "STANDBY MODE," except during CEA motion permitted by Required Action ~~B.2.~~ ***B.2.2***	4 hours
	AND	
	~~B.5~~ ***B.2.5*** Perform SR 3.1.5.1.	Once per 4 hours
	AND	
	~~B.6~~ ***B.2.6*** Disable the Reactor Power Cutback System (RPCS)	4 hours
~~C. Receipt of a CPC channel B or C cabinet high temperature alarm.~~	~~C.1 Perform CHANNEL FUNCTIONAL TEST on affected CEAC(s).~~	~~12 hours~~
~~D. One or two CEACs with three or more auto restarts during a 12 hour period.~~	~~D.1 Perform CHANNEL FUNCTIONAL TEST on affected CEAC.~~	~~24 hours~~
~~E~~ ***C***. Required Action and associated Completion Time of Condition B~~, C, or D~~ not met.	~~E~~ ***C***.1 Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE	FREQUENCY
SR 3.3.3.1 Perform a CHANNEL CHECK.	12 hours
SR 3.3.3.2 ~~Check the CEAC auto restart count~~ ***Deleted***	~~12 hours~~
SR 3.3.3.3 Perform a CHANNEL FUNCTIONAL TEST.	92 days
SR 3.3.3.4 Perform a CHANNEL CALIBRATION.	18 months
SR 3.3.3.5 Perform a CHANNEL FUNCTIONAL TEST.	18 months
~~SR 3.3.3.6 Verify the isolation characteristics of each CEAC isolation amplifier.~~	~~18 months~~