7.0 INSTRUMENTATION AND CONTROLS

Chapter 7, “Instrumentation and Controls,” (I&C) of the Comanche Peak Nuclear Power Plant (CPNPP), Units 3 and 4, Combined License (COL) Final Safety Analysis Report (FSAR), Part 2, Revision 3 incorporates by reference, with no departures or supplements, Sections 7.1 through 7.3, and Sections 7.6 through 7.9 of the United States - Advance Pressurized Water Reactor (US-APWR) Design Control Document (DCD), Revision 3. Sections 7.4 and 7.5 were supplemented by the CPNPP FSAR and the results of the staff’s technical evaluation are presented here.

The staff is reviewing the information in the US-APWR DCD under Docket Number 52-021. The results of the staff’s technical evaluation of the information related to I&C incorporated by reference in the CPNPP, Units 3 and 4, COL FSAR will be documented in the staff’s final safety evaluation report (FSER) on the design certification (DC) application for the US-APWR. The safety evaluation (SE) for the US-APWR DC application is not yet complete, and this is being tracked as part of **Open Item 1-1**. The staff will update Chapter 7 of this SE to reflect the final disposition of the DC application design.

Chapter 7 provides information on the systems and components which sense various reactor parameters and transmits signals to the control systems during normal operations and to the reactor trip and engineered safety features systems during abnormal and accident conditions.

7.1 INTRODUCTION

Section 7.1, “Introduction,” of the CPNPP, Units 3 and 4, COL FSAR, Part 2, Revision 3 incorporates by reference, with no departures or supplements, Section 7.1, “Introduction,” of the US-APWR DCD, Revision 3. The staff is reviewing the information in US-APWR DCD Section 7.1, “Introduction,” under Docket Number 52-021. The results of the staff’s technical evaluation of the information related to I&C systems incorporated by reference in the CPNPP, Units 3 and 4, COL FSAR will be documented in the staff’s FSER on the DC application for the US-APWR.

The SE for the US-APWR DC application is not yet complete, and this is being tracked as part of **Open Item 1-1**. The staff will update Section 7.1, “Introduction,” of this SE to reflect the final disposition of the DC application design.

7.2 REACTOR TRIP SYSTEM

Section 7.2, “Reactor Trip System,” of the CPNPP, Units 3 and 4, COL FSAR, Part 2, Revision 3 incorporates by reference, with no departures or supplements, Section 7.2, “Reactor Trip System,” of the US-APWR DCD, Revision 3. The staff is reviewing the information in US-APWR DCD Section 7.2, “Reactor Trip System,” under Docket Number 52-021. The results of the staff’s technical evaluation of the information related to the reactor trip systems incorporated by reference in the CPNPP, Units 3 and 4, COL FSAR will be documented in the staff’s FSER on the DC application for the US-APWR.

The SE for the US-APWR DC application is not yet complete, and this is being tracked as part of **Open Item 1-1**. The staff will update Section 7.2, “Reactor Trip System,” of this SE to reflect the final disposition of the DC application design.

7.3 ENGINEERED SAFETY FEATURE SYSTEMS

Section 7.3, "Engineered Safety Feature Systems," of the CPNPP, Units 3 and 4, COL FSAR, Part 2, Revision 3 incorporates by reference, with no departures or supplements, Section 7.3, "Engineered Safety Feature Systems," of the US-APWR DCD, Revision 3. The staff is reviewing the information in US-APWR DCD Section 7.3, "Engineered Safety Feature Systems," under Docket Number 52-021. The results of the staff's technical evaluation of the information related to the engineered safety features systems incorporated by reference in the CPNPP, Units 3 and 4, COL FSAR will be documented in the staff's FSER on the DC application for the US-APWR.

The SE for the US-APWR DC application is not yet complete, and this is being tracked as part of **Open Item 1-1**. The staff will update Section 7.3, "Engineered Safety Feature Systems," of this SE to reflect the final disposition of the DC application design.

7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN

7.4.1 Introduction

This section describes aspects of I&C and supporting systems designed to achieve and maintain a safe and orderly reactor shutdown.

7.4.2 Summary of Application

Section 7.4, "Systems Required for Safe Shutdown," of the CPNPP, Units 3 and 4, COL FSAR, Part 2, Revision 3, incorporates by reference Section 7.4 of the US-APWR DCD, Revision 3, with supplemental information in two subsections that is related to a "Combined License Information" (COL) item. The two affected FSAR subsections are Subsection 7.4.1.6, "Normal and Safe Shutdown Functions," and Subsection 7.4.4, "Combined License Information."

Subsection 7.4.4 identifies the COL item in the left column with the following labels:

CP COL 7.4(1)
STD COL 7.4(1)

Subsection 7.4.4 then provides the full text of the COL item. The COL item requires that the COL applicant provide a description of the component controls and indications required for safe shutdown related to the ultimate heat sink (UHS). The subsection then refers back to FSAR Subsection 7.4.1.6 and includes two tables containing the details of the site-specific information requested to address the COL item.

Subsection 7.4.1.6 similarly identifies the same COL item in the left column with the label, STD COL 7.4(1). The subsection states that the second paragraph in DCD Subsection 7.4.1.6 is replaced with site-specific information on the shutdown functions related to the UHS. The second paragraph in Subsection 7.4.1.6 of the referenced DCD is simply a placeholder for the COL applicant to provide site-specific information on the shutdown functions related to the UHS.

7.4.3 Regulatory Basis

The regulatory basis of the information incorporated by reference and the supplemental information presented in this application is addressed within the FSER related to the DCD and is not repeated in its entirety here.

Regulatory basis that can be considered to address the site-specific information for UHS controls and indications related to normal and safe shutdown are: 10 CFR 50, Appendix A, GDC 13 and GDC 19, and 10 CFR 52.80(a).

7.4.4 Technical Evaluation

The staff reviewed Section 7.4 of the CPNPP, Units 3 and 4, COL FSAR and the referenced DCD. The staff's review confirmed that the information contained in the application, and incorporated by reference, addresses the relevant information related to the "Systems Required for Safe Shutdown." Section 7.4 of the US-APWR DCD is being reviewed by the staff under Docket Number 52-021. The results of the staff's technical evaluation of the information related to the "Systems Required for Safe Shutdown," incorporated by reference in the CPNPP, Units 3 and 4, COL FSAR will be documented in the staff's FSER on the DC application for the US-APWR. The SE on the US-APWR is not yet complete, and this is being tracked as part of **Open Item 1-1**. The staff will update Section 7.4 of this SE to reflect the final disposition of the DC application.

In the COL FSAR, Subsection 7.4.4, the COL Information Item, CP COL 7.4(1), states, "Description of component controls and indications required for safe shutdown related to UHS." Subsection 7.4.4, further states, "This Combined License (COL) item is addressed in Subsection 7.4.1.6, and Tables 7.4-201 and 7.4-202."

Subsection 7.4.1.6 of the CPNPP, Units 3 and 4, COL FSAR incorporates by reference DCD Subsection 7.4.1.6 but replaces the second paragraph with the following: "Site-specific component control and indication to achieve shutdown and as related to the ultimate heat sink (UHS) is presented in Tables 7.4-201 and 7.4-202. A system description of the UHS is provided in Subsection 9.2.5." Table 7.4-201, "Site-Specific Component Controls for Shutdown," is a site-specific COL item (CP COL 7.4(1)) that lists the site-specific component controls for shutdown. Table 7.4-202, "Site-Specific Indication for Shutdown," is a standard COL item (STD COL 7.4(1)) that lists site-specific indicating instruments for shutdown. Both tables provide columns which identify whether the component or indication is required for normal shutdown or safe shutdown. A safe shutdown is a reactor shutdown with the reactivity of the reactor kept subcritical and the reactor temperature as specified by the technical specifications for the unit. A safe shutdown is usually a reactor shutdown associated with an emergency event and potential or actual damaged or failed SSCs and using only safety-related equipment. A normal shutdown is the routine operation of taking the reactor to hot or cold shutdown conditions as defined in technical specifications and using normal designated equipment as at the beginning of a refueling outage or a mid-cycle shutdown for system repairs or inspections requiring being in a shutdown mode. A normal shutdown may also occur in anticipation of an event as the approach of a hurricane.

The staff reviewed the applicant's description of the UHS. The UHS is a safety-related system required to remove heat from the essential service water system (ESWS) during normal operation, transients, accidents and design basis events, and provide the required cooling for a minimum of 30 days without make-up during all plant operating conditions including normal plant operations, abnormal and accident conditions as described in FSAR subsections under Subsection 9.2.5, "Ultimate Heat Sink." The staff reviewed the procedures and criteria described in Revision 5 of Section 7.4, "Safe Shutdown Systems," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants - LWR [light-water reactor] Edition,") and noted the interface requirements for the UHS related to I&C. The UHS system is required to have alarms and displays in the Main Control Room (MCR) and remote shutdown control area for UHS water level and water temperature. The UHS system is required to have controls in the MCR and remote shutdown control area for UHS components' active safety functions if applicable to the site-specific design. Table 7.4-202 identifies the UHS water level and water temperature indicators. Table 7.4-201 identifies the site-specific component controls.

During the staff's review of COL FSAR, Revision 0, the following request for additional information (RAI) was issued, since the I&C for this site-specific safety system needs to adequately describe the UHS indications in the control room to achieve safe shutdown.

> **RAI 2504, Question 07.04-1** (ID 10247): 10 CFR [*Code of Federal Regulations*] Part 50, Appendix A, General Design Criteria 19 (GDC 19) requires, in part, that instrumentation and controls be provided to safely operate the nuclear unit under normal conditions and to maintain it in a safe condition under accident conditions.
>
> Please provide a system description of the ultimate heat sink (UHS), including how it is used to achieve normal and safe shutdown and any interactions with other systems with the same functions. The COL should not only identify but also describe any supporting systems.
>
> Section 7.4 of the Final Safety Analysis Report (FSAR) identifies ultimate heat sink indications in the control room to achieve safe shutdown. Please provide a system description, including how the systems interact to achieve a safe shutdown.

In its response to this RAI, dated May 26, 2009, the applicant revised Subsection 7.4.1.6 to add the second sentence which referenced Subsection 9.2.5 as the location of the UHS system description. COL FSAR, Subsection 9.2.5, is evaluated in Chapter 9 of this SE. The staff reviewed the information in COL FSAR, Revision 3, Subsection 9.2.5, related to the UHS I&C and found it acceptable. **Question 07.04-1 (RAI 2504 - ID 10247) is considered to be closed**.

GDC 13, “Instrumentation and control,” requires instrumentation be provided to monitor variables and systems over anticipated ranges for normal operation, AOO, and accident conditions as appropriate to assure adequate safety and also provide appropriate controls to maintain these variables and systems within prescribed operating ranges. The FSAR provided Tables 7.4-201 and 7.4-202 which list the components and indications related to control of the UHS during reactor shutdown operations. FSAR Subsection 9.2.5.2.1, “General Description,” provides a description of the UHS. FSAR Subsection 9.2.5.2.2, “System Operation,” provides a description of the UHS system operation in conjunction with the ESWS. FSAR Subsection 9.2.5.5, “Instrumentation Requirements,” provides a description of the instrumentation requirements to control and monitor the UHS including normal and safe shutdown operations and is supported by FSAR Table 9.2.5-4R, “Ultimate heat Sink System Failure Modes and Effects Analysis,” concerning UHS failure modes and effects analysis. FSAR Subsection 9.2.1, “Essential Service Water System,” provides a description of the ESWS and FSAR Subsection 9.4.5, “Engineered Safety Feature Ventilation System,” provides a description of the UHS ESW pump house ventilation system. COL FSAR, Sections 9.2.1, 9.2.5, and 9.4.5 are evaluated in Chapter 9 of this SE. The staff finds the components and indications listed in Tables 7.4-201 and 7.4-202 of Revision 3 of the FSAR are consistent with those described in Section 9.2.1, 9.2.5, and 9.4.5 of Revision 3 of the FSAR.

Based on the above and the staff’s review of the UHS system description in Subsection 9.2.5 of the COL FSAR, Revision 3, as referenced by Subsection 7.4.1.6 of the COL FSAR, the staff determined that the controls provided for the UHS system include redundant, safety-related components for both normal shutdown and safe shutdown, that no single failure can prevent the system from accomplishing its safety function, and that the critical indication of UHS basin water level has two indicators per basin as well as a temperature indication. The staff finds that the FSAR site-specific information provided by the applicant is consistent with the requirements of GDC 13.

GDC 19, “Control room,” requires in part a control room containing instrumentation and controls from which actions can be taken to operate the nuclear power unit safely and equipment at appropriate locations outside the control room with instrumentation and controls with a design capability for prompt hot shutdown of the reactor and subsequent cold shutdown. FSAR, Revision 3, Sections 9.2.1, 9.2.5, and 9.4.5 describe the instrumentation and control capability related to the UHS and the location in MCR that are evaluated in Chapter 9 of this SE. Chapters 7 and 9 of the referenced DCD describe both the MCR and the Remote Shutdown Room (RSR) and the instrumentation and control capability that in the event the MCR is uninhabitable the control and monitoring of normal and safe shutdown functions can be performed from the RSR. Since the components and indications listed in Tables 7.4-201 and 7.4-202 are consistent with those described, evaluated, and found acceptable in Section 9.2.1, 9.2.5, and 9.4.5 of this SE, the staff finds that the FSAR site-specific information provided by the applicant concerning the UHS is consistent with the requirements of GDC 19.

10 CFR 52.80(a) requires that a COL application contain the proposed inspections, tests, analyses, and acceptance criteria (ITAAC). The COL application, Part 10 – Appendix A.1, Ultimate Heat Sink System (UHSS) and Essential Service Water System (ESWS) (Portions Outside the Scope of the Certified Design), provides the ITAAC for the UHSS and the ESWS. Appendix A.2, UHS ESW Pump House Ventilation System, provides the ITAAC for UHS ESW Pump House Ventilation System (also outside the scope of the certified design). Appendices A.1 and A.2 include design description, seismic category listing, identification of power components and Class 1E, qualification for harsh environment, identification of specific instrumentation and controls, and their location, and the standard three-column formatted ITAAC. COL FSAR, Revision 3, Sections 9.2.1, 9.2.5, and 9.4.5 and their associated ITAAC are evaluated in Chapter 9 of this SE. The staff finds the components and indications listed in Tables 7.4-201 and 7.4-202 are consistent with those described, evaluated, and found acceptable in Section 9.2.1, 9.2.5, and 9.4.5 of this SE. The staff finds that the FSAR site specific COL information related to the UHS provided by the applicant adequately addresses the requirement of 10 CFR 52.80(a).

The staff finds that the COL Item 7.4(1) has been adequately addressed, because it provides the information requested including the interface requirements for the UHS related to I&C and meets the requirements of GDC 13, 19 and 10 CFR 52.80(a) as described above.

7.4.5 Post Combined License Activities

There are no post COL activities related to this section.

7.4.6 Conclusion

The staff is reviewing the information in DCD Section 7.4 under Docket Number 52-021. The results of the staff's technical evaluation of the information related to the systems required for safe shutdown, incorporated by reference in the CPNPP, Units 3 and 4, COL FSAR, will be documented in the staff's SE on the DC application for the US-APWR. The SE on the US-APWR is not yet complete, and this is being tracked as part of **Open Item 1-1**. The staff will update Section 7.4 of this SE to reflect the final disposition of the DC application.

In addition, the staff concludes that the site-specific I&C information presented within the COL FSAR is acceptable and the COL information item has been adequately addressed based on the following: 1) CPNPP, Units 3 and 4, COL Subsection 7.4.1.6 is acceptable because it references the detailed system description of the UHS in Subsection 9.2.5, which the staff reviewed and found acceptable in Section 9.2.5 of the FSER; 2) Tables 7.4-201 and 7.4-202 are provided as part of the COL item and address the requirements of GDC 13 and 19 and 10 CFR 52.80(a) ; 3) Tables 7.4-201 and 7.4-202 provide a list of components and indications related to the UHS that are adequate for achieving both normal shutdown and safe shutdown and are consistent with those described and evaluated in Section 9.2.1, 9.2.5, and 9.4.5 of this SE; and 4) redundant indicators are provided for the critical basin water level.

7.5 INFORMATION SYSTEMS IMPORTANT TO SAFETY

7.5.1 Introduction

This section describes safety-related display systems that provide information for the safe operation of the plant during normal operation, anticipated operational occurrences, and accidents.

7.5.2 Summary of Application

Section 7.5, "Information Systems Important to Safety," of the CPNPP, Units 3 and 4, COL FSAR, Part 2, Revision 3, incorporates by reference Section 7.5 of the US-APWR DCD, Revision 3 with supplemental information in three subsections that are related to two COL items. The three affected FSAR subsections are Subsection 7.5.1.1, "Post-Accident Monitoring," Subsection 7.5.1.6.2, "Emergency Operations Facilities," and Subsection 7.5.4, "Combined License Information."

Subsection 7.5.4 identifies the COL items in the left column with the following labels:

CP COL 7.5(1)
STD COL 7.5(1)

CP COL 7.5(2)

Subsection 7.5.4 then provides the full text of two COL items. COL Information Item CP COL 7.5(1) requires that the COL applicant provide a description of the Post-Accident Monitoring (PAM) variables related to the UHS. The subsection then refers back to FSAR Subsection 7.5.1.1 and includes Table 7.5-201, "Site-Specific PAM Variables," which contains the details required by the site-specific COL item. COL Information Item CP COL 7.5(2) requires that the COL applicant provide a description of the site-specific emergency operations facility (EOF) and refers back to FSAR Subsection 7.5.1.6.2.

Subsection 7.5.1.1 similarly identifies the COL item in the left column with the label, STD COL 7.5(1). The subsection states that the seventh paragraph in DCD Subsection 7.5.1.1 is replaced with site-specific information on the PAM variables related to the UHS and meteorological parameters. The seventh paragraph in Subsection 7.5.1.1 of the referenced DCD is simply a placeholder for the COL applicant to provide site-specific information on the PAM variables.

Subsection 7.5.1.6.2 similarly identifies the COL item in the left column with the label, CP COL 7.5(2). The subsection states that the third paragraph in DCD Subsection 7.5.1.6.2 is replaced with site-specific information on the EOF. The third paragraph in Subsection 7.5.1.6.2 of the referenced DCD is simply a placeholder for the COL applicant to provide site-specific information on the EOF.

7.5.3 Regulatory Basis

The regulatory basis of the information incorporated by reference and the supplemental information presented in this application is addressed within the FSER related to the DCD and is not repeated in its entirety here.

Regulatory basis that can be considered to address the site-specific PAM type D variables related to the UHS are: 10 CFR 50.34(f)(2)(xix), and 10 CFR 52.80(a).

Regulatory basis that can be considered to address the site-specific PAM type E variables related to the meteorological parameters are: 10 CFR 50.47 and Appendix E to 10 CFR Part 50.

Regulatory basis that can be considered to address the site-specific EOF are: 10 CFR 50.34(f)(2)(xxv) and 10 CFR Part 50, Appendix E, Section IV(E)(8).

7.5.4 Technical Evaluation

The staff reviewed Section 7.5 of the CPNPP, Units 3 and 4, COL FSAR and the referenced DCD. The staff's review confirmed that the information contained in the application, and incorporated by reference, addresses the relevant information related to this "Information Systems Important to Safety." Section 7.5 of the US-APWR DCD is being reviewed by the staff under Docket Number 52-021. The results of the staff's technical evaluation of the information related to the "Information Systems Important to Safety," incorporated by reference, in the CPNPP, Units 3 and 4, COL FSAR will be documented in the staff's FSER on the DC application for the US-APWR. The SE on the US-APWR is not yet complete, and this is being tracked as part of **Open Item 1-1**. The staff will update Section 7.5 of this SE to reflect the final disposition of the DC application.

In the COL FSAR, Subsection 7.5.4, the COL Information Item, CP COL 7.5(1), states, "Description of site-specific PAM variables." Subsection 7.5.4, further states, "This COL item is addressed in Subsection 7.5.1.1, and Table 7.5-201."

Subsection 7.5.1.1 of the CPNPP, Units 3 and 4, COL FSAR incorporates by reference DCD Subsection 7.5.1.1, but replaces the seventh paragraph with the following: "Site-specific type D post accident monitoring (PAM) variables related to the UHS and site-specific type E PAM variables for monitoring the meteorological parameters are presented in Table 7.5-201." Table 7.5-201 lists type D variables, range, monitored function or system, and the quantity of sensors for each variable for the UHS. Table 7.5-201 also lists the site-specific (type E) PAM meteorological types of variables and refers to CPNPP, Units 3 and 4, COL FSAR Subsection 2.3.3.2, where the performance of the meteorological tower instrumentation is discussed.

Using the procedures and criteria described in Revision 5 of Section 7.5, "Information Systems Important to Safety," of the SRP, the staff reviewed the FSAR, Revision 3, description of the PAM variables related to the UHS included under Section 7.5, and the PAM variables related to the on-site meteorological measurements system program in Subsection 2.3.3. The staff also reviewed the applicant's description of the safety-related, Seismic Category I, UHS SSC required for safe shutdown in FSAR, Revision 3, Subsection 9.2.5 and the description of PAM variables in the DCD, Revision 3, Section 7.5.

Regulation 10 CFR 50.34(f)(2)(xix) requires in part instrumentation adequate for monitoring plant conditions following an accident. Regulatory Guide (RG) 1.97, Revision 4, describes methods acceptable to the staff for meeting this regulation and providing instrumentation to monitor variables for accident conditions. Branch Technical Position 7-10, Revision 4, "Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants," endorses, with exceptions and clarifications, IEEE Std. 497-2002, "IEEE Standard Criteria for Accident Monitoring Instrumentation for Nuclear Power Generating Stations." IEEE Std. 497-2002, Table 1, summarizes the selection criteria for accident monitoring variable types. Type D includes variables that: 1) indicate the performance of safety systems, 2) indicate the performance of other systems necessary to achieve and maintain a safe shutdown condition, and 3) verify safety system status. Type E includes variables that monitor the environmental conditions (meteorological conditions) used to determine the impact of releases of radioactive materials.

FSAR, Revision 3, Table 7.5-201 identifies UHS related Type D site-specific variables as UHS basin water level and water temperature and ESW header pressure. The primary parameter for adequate monitoring of the UHS is the basin water level. This is required because a sufficient volume of water, as specified by RG 1.27, “Ultimate Heat Sink for Nuclear Power Plants,” must be maintained in the basins and this Type D instrumentation provides the required data for information as well as control. RG 1.97 does not require redundancy for type D and E variables, but the applicant provides two UHS basin water level instruments per basin with a range capable of measuring 0 to 100% span (basically near minimum to full volume.) The UHS basin temperature is provided as a secondary key parameter with one instrument per basin. While not as critical as water level, this instrument, with a sufficiently bounding range of 32°F to 140°F, can help verify the design parameter for the temperature of the hot inlet water of 128°F and cold outlet water of 95°F and provide an indication of the effectiveness of cooling by the UHS. The ESW header pressure is a primary performance monitoring parameter, because it basically indicates how ESW pumping systems are performing and whether there are serious leakage or pipe breaks as noted in Table 7.5-9, Function of Type D PAM Variables, of the referenced DCD. The ESW header pressure has one instrument per line with a instrument range of 0 to 150 psig that covers the design pressure range of the pump.

FSAR, Revision 3, Table 7.5-201 also identifies the meteorological parameters as PAM type E variables (with one instrument per variable) as wind speed, wind direction, temperature, and delta-temperature and references FSAR Subsection 2.3.3.2, where the performance of the meteorological tower instrumentation is discussed. The data from the site primary and secondary meteorological towers is supplied to the Meteorological System Computer; CPNPP, Units 1 and 2, Plant Computers; and paperless digital recorders in the combined Main Control Room (MCR) for CPNPP, Units 1 and 2, and the MCRs for CPNPP, Units 3 and 4. The meteorological instrumentation measurements system is described in FSAR, Subsection 2.3.3, and is evaluated in Chapter 2 of this SE. The staff finds the meteorological variables listed in Table 7.5-201 are consistent with those evaluated and found acceptable in Section 2.3.3 of this SE.

DCD, Revision 3, Table 7.5-2, "PAM Main Design Criteria for Each Variable Type," summarizes the design requirements for each PAM type. Type D variables require seismic qualification, environmental qualification, power supplies, and testability. Type E variables require power supplies, testability, and recording of the data. DCD Subsection 7.5.1.1, Post-Accident Monitoring, describes PAM variable classifications and design attributes including seismic qualification, environmental qualification, power supplies, testability, display in the control room, and recording. DCD Subsection 7.5.2.1, Post Accident Monitoring, states conformance to the requirements of codes and standards for PAM variables including 10 CFR 50.34(f)(2)(xix), RG 1.97, and IEEE Std. 497-2002. Subsections 7.5.1.1 and 7.5.2.1 of the reference DCD are incorporated by reference in the COL FSAR, with the exception of the substitution discussed in Subsection 7.5.2 of this SE. The components and indications listed in Table 7.5-201 of Revision 3 of the FSAR, are consistent with those in Subsections 7.5 and 2.3.3 of the US-APWR DCD and Subsections 9.2.5 and 2.3.3 of this SE. Based on the above the staff finds that the FSAR site-specific information provided by the applicant concerning the PAM variables related to the UHS and the meteorological parameters adequately addresses the requirements of 10 CFR 50.34(f)(2)(xix).

10 CFR 52.80(a) requires that a COL application contain the proposed inspections, tests, analyses, and acceptance criteria (ITAAC). The COL application, Part 10 – Appendix A.1, Ultimate Heat Sink System (UHSS) and Essential Service Water System (ESWS) (Portions Outside the Scope of the Certified Design), provides the ITAAC for the UHSS and the ESWS. Appendix A.2, UHS ESW Pump House Ventilation System, provides the ITAAC for UHS ESW Pump House Ventilation System (also outside the scope of the certified design). Appendices A.1 and A.2 include design description, seismic category listing, identification of Class 1E components, qualification for harsh environment, identification of specific instrumentation and controls and their location, and the standard three column formatted ITAAC. COL FSAR, Subsections 9.2.1, 9.2.5, and 9.4.5 and their associated ITAAC are evaluated in Chapter 9 of this SE. The staff finds the components and indications listed in Tables 7.4-201, 7.4-202, and 7.5-201 are consistent with each other and with those described and evaluated in Subsection 9.2.1, 9.2.5, and 9.4.5 of this SE. The staff finds that the FSAR site specific COL information related to the UHS provided by the applicant adequately addresses the requirement of 10 CFR 52.80(a).

10 CFR 50.47 and Appendix E to 10 CFR Part 50 specify requirements for emergency preparedness planning. Some emergency preparedness planning requirements focus on determining the magnitude, and assessing the impact, of radioactive releases to the environment. Hence, methods, systems, and equipment are required for assessing and monitoring offsite consequences. Meteorological parameters provide an integral part of the data needed to establish atmospheric dispersion factors for assessing offsite doses from airborne releases of radioactive material. The applicant's COL item Table 7.5-201 also identifies the meteorological parameters as PAM type E variables as wind speed, wind direction, temperature, and delta temperature (with one instrument per variable with variables at upper and lower levels on the meteorological towers, e.g. wind speeds at the 10-meter and 60-meter levels) and references COL FSAR Subsection 2.3.3.2, where the performance of the meteorological tower instrumentation is discussed. The data from the site primary and secondary meteorological towers is supplied to the Meteorological System Computer, CPNPP, Units 1 and 2, Plant Computers, and paperless digital recorders in the combined Main Control Room (MCR) for CPNPP, Units 1 and 2, and the combined MCR for CPNPP, Units 3 and 4. The meteorological instrumentation measurements system in COL FSAR, Subsection 2.3.3, is evaluated in Chapter 2 of this SE. The staff finds the requirements of 10 CFR 50.47 and

Appendix E to 10 CFR Part 50 related to the PAM type E meteorological variables are adequately addressed, because the meteorological variables listed in Table 7.5-201 are consistent with those evaluated and found acceptable in Section 2.3.3 of this SE.

Based on these factors above and the descriptions in Subsections 9.2.5 and 2.3.3 of the CPNPP, Units 3 and 4, COL FSAR, which the staff has evaluated and found acceptable in Sections 9.2.5 and 2.3.3 of this SE, the staff finds that COL Information Item 7.5(1) has been adequately addressed.

In the CPNPP, Units 3 and 4, COL FSAR, Subsection 7.5.4, the COL item, CP COL 7.5(2), states, "Description of site-specific EOF." Subsection 7.5.4, further states, "This COL item is addressed in Subsection 7.5.1.6.2." Subsection 7.5.1.6.2 of the CPNPP, Units 3 and 4, COL FSAR incorporates by reference DCD Subsection 7.5.1.6.2, but replaces the third paragraph with a summary description of the EOF that includes location, amount of working space, square footage, designation of space for specific functions, and displays and indications.

The staff reviewed the applicant's description of the emergency operations facilities using the review procedures described in Section 7.5 of NUREG-0800. The staff evaluated the functional performance of the EOF in Chapter 13, Conduct of Operations, of this SE. During the staff's review, the following RAI was issued, because the I&C for this site-specific EOF needs to specifically clarify that the information displayed for the EOF will be the same as that available to the TSC and MCR, but that the TSC and EOF will not have any control over plant systems to adequately address the COL item:

> **RAI 2506, Question 07.05-1** (ID 10248): 10 CFR Part 50, Appendix E, Section IV(E)(8) requires that "[a]dequate provisions shall be made and described for emergency facilities and equipment including: …a licensee near-site emergency operations facility from which effective direction can be given and effective control can be exercised during an emergency."
>
> The COL FSAR Section 7.5 states that the display capability of the Emergency Operations Facility (EOF) is similar to the ones in the main control room (MCR) and the technical support center (TSC). Please provide either a description of the display capability of the EOF or explain in greater detail where the display capability of the EOF will be the same as the MCR and TSC, and what the differences will include. Additionally, please clarify the extent of information that will be presented to personnel in the EOF. Will personnel be able to observe plant parameters and not control plant systems?

The applicant's response to this RAI, dated May 26, 2009, provided a supplement to the FSAR that described the location and general physical features as size of the EOF. The applicant also stated that the information displayed in the EOF, MCR, and TSC is identical with unit selection capability, but the manner in which it is displayed may vary (e.g. single screen verses multiple screens and single monitor verses multiple monitors, etc.). The staff finds that not having identical display equipment is acceptable, because guidance acceptance criteria is concerned that there is identical data availability in EOF, MCR, and TSC presented in an acceptable human-factored manner adequate for the mission and meeting safety and non-safety independence criteria, rather than whether it is on one screen or multiple screens. The applicant specifically stated that neither the EOF nor the TSC has plant control capability. The staff reviewed the site-specific I&C information in COL FSAR Subsection 7.5.1.6.2, involving the

displays and data communication equipment, and found it acceptable because it provided the specifically requested information and answered the staff concern over whether there was any capability of the EOF or TSC to exert physical control over plant functions from these locations. **RAI 07.05-1 (RAI 2506 - Question 10248) is considered to be closed**.

10 CFR 50.34(f)(2)(xxv) requires in part that an onsite Technical Support Center, an onsite Operational Support Center, and a near-site Emergency Operations Facility be provided. Also, 10 CFR Part 50, Appendix E, Section IV(E)(8), requires in part that a licensee provide an emergency operations facility from which effective direction can be given and effective control can be exercised during an emergency. The preferred site is a primary EOF to be located less than 10 miles from the nuclear plant site; which may serve more than one plant; has capability for obtaining and displaying plant data and radiological information; and has space for members of an NRC site team and federal, state, and local responders. To address COL item 7.5(2), FSAR Subsection 7.5.1.6.2 states that the EOF of the CPNPP, Units 3 and 4, is located in the existing nuclear operations support facility, which is west of the reactor building and with workspace for the personnel assigned to the EOF, including federal, state, and local emergency personnel. The EOF is designed and equipped to support continuous operations over an extended period of time. Displays associated with CPNPP Units 3 and 4 are common to both units with a unit-display selection capability. Post-accident monitoring, bypassed and inoperable status indication, plant alarms, and safety parameter display system information is displayed on non-safety human-system interface equipment in the EOF. The information displayed in the EOF, MCR, and TSC is identical. The displays and communication related auxiliary equipment is strategically located in the existing EOF. The EOF as a part of the emergency plan is evaluated in Section 13.3 of this SE. The staff finds the requirements of 10 CFR 50.34(f)(2)(xxv) and 10 CFR Part 50, Appendix E, Section IV(E)(8), related to the EOF are adequately addressed, because the provided description of the facilities and capabilities are consistent with information on the EOF as part of the emergency plan evaluated and found acceptable in Section 13.3 of this SE.

Based on the staff's review of the site-specific information on the EOF provided in CPNPP Units 3 and 4 COL FSAR, Subsection 7.5.1.6.2, discussed above, the staff finds COL Item 7.5(2) has been adequately addressed, because: 1) the information displayed in the EOF, MCR, and TSC are identical, although the manner in which it is displayed may vary, 2) that neither the EOF nor the TSC data display and communications has plant control capability, and 3) that the site-specific information provided by the applicant related to the EOF conforms to the requirements of 10 CFR 50.34(f)(2)(xxv) and 10 CFR Part 50, Appendix E, Section IV(E)(8).

Therefore, the staff finds that the FSAR supplemental information provided by the applicant is consistent with the guidance and criteria of the SRP, conforms to the applicable regulations, and that the COL Item 7.5(1) and COL Item 7.5(2) have been adequately addressed.

7.5.5 Post Combined License Activities

There are no post COL activities related to this section.

7.5.6 Conclusion

The staff is reviewing the information in DCD Section 7.5 under Docket Number 52-021. The results of the staff's technical evaluation of the information systems important to safety, incorporated by reference, in the CPNPP, Units 3 and 4, COL FSAR will be documented in the staff's SE report on the DC application for the US-APWR. The SE on the US-APWR is not yet complete, and this is being tracked as part of **Open Item 1-1**. The staff will update Section 7.5 of this SE to reflect the final disposition of the DC application.

Based on the analysis above, the staff concludes that the relevant I&C information presented within the FSAR COL item 7.5(1) is acceptable and the COL information item has been adequately addressed, because: 1) the requirements of 10 CFR 50.34(f)(2)(xix), and 10 CFR 52.80(a) for the site-specific PAM type D variables related to the UHS and the requirements of 10 CFR 50.47 and Appendix E to 10 CFR Part 50 related to the PAM type E meteorological variables are adequately addressed, and 2) the PAM type D and E variables are available in the MCR and are adequate for monitoring the UHS and meteorological parameters respectfully.

In addition, the staff concludes that the relevant I&C information presented within the FSAR COL item 7.5(2) is acceptable and the COL information item has been adequately addressed, because: 1) the system description of the EOF provides adequate provisions for emergency facilities and equipment and meets the requirements of 10 CFR 50.34(f)(2)(xxv) and 10 CFR Part 50, Appendix E, Section IV(E)(8), related to the EOF, 2) information displayed in the EOF, MCR, and TSC is identical with unit selection capability, and 3) neither the EOF nor the TSC data display and communication systems has control capability over the plant.

7.6 INTERLOCK SYSTEMS IMPORTANT TO SAFETY

Section 7.6, "Interlock Systems Important to Safety," of the CPNPP, Units 3 and 4, COL FSAR, Part 2, Revision 3 incorporates by reference, with no departures or supplements, Section 7.6, "Interlock Systems Important to Safety," of the US-APWR DCD, Revision 3. The staff is reviewing the information in US-APWR DCD Section 7.6, "Interlock Systems Important to Safety," under Docket Number 52-021. The results of the staff's technical evaluation of the information related to the interlock systems important to safety incorporated by reference in the CPNPP, Units 3 and 4, COL FSAR will be documented in the staff's FSER on the DC application for the US-APWR.

The SE for the US-APWR DC application is not yet complete, and this is being tracked as part of **Open Item 1-1**. The staff will update Section 7.6, "Interlock Systems Important to Safety," of this SE to reflect the final disposition of the DC application design.

7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY

Section 7.7, "Control Systems Not Required For Safety," of the CPNPP, Units 3 and 4, COL FSAR, Part 2, Revision 3, incorporates by reference, with no departures or supplements, Section 7.7, "Control Systems Not Required For Safety," of the US-APWR DCD, Revision 3. The staff is reviewing the information in US-APWR DCD Section 7.7, "Control Systems Not Required For Safety," under Docket Number 52-021. The results of the staff's technical evaluation of the information related to the control systems not required for safety incorporated

by reference in the CPNPP, Units 3 and 4, COL FSAR will be documented in the staff's FSER on the DC application for the US-APWR.

The SE for the US-APWR DC application is not yet complete, and this is being tracked as part of **Open Item 1-1**. The staff will update Section 7.7, "Control Systems Not Required For Safety," of this SE to reflect the final disposition of the DC application design.

7.8 DIVERSE INSTRUMENTATION AND CONTROL SYSTEMS

Section 7.8, "Diverse Instrumentation and Control Systems," of the CPNPP, Units 3 and 4, COL FSAR, Part 2, Revision 3, incorporates by reference, with no departures or supplements, Section 7.8, "Diverse Instrumentation And Control Systems," of the US-APWR DCD, Revision 3. The staff is reviewing the information in US-APWR DCD Section 7.8, "Diverse Instrumentation and Control Systems," under Docket Number 52-021. The results of the staff's technical evaluation of the information related to the diverse instrumentation and control systems incorporated by reference in the CPNPP, Units 3 and 4, COL FSAR will be documented in the staff's FSER on the DC application for the US-APWR.

The SE for the US-APWR DC application is not yet complete, and this is being tracked as part of **Open Item 1-1**. The staff will update Section 7.8, "Diverse Instrumentation and Control Systems," of this SE to reflect the final disposition of the DC application design.

7.9 DATA COMMUNICATIONS SYSTEMS

7.9.1 Introduction

This section describes aspects of I&C and supporting systems designed to provide data communications.

7.9.2 Summary of Application

Section 7.9, "Data Communications Systems," of the CPNPP, Units 3 and 4, COL FSAR, Part 2, Revision 2, incorporated by reference, Section 7.9 of the US-APWR DCD, Revision 3, with supplemental information in two subsections that were related to a COL item. The two affected subsections were Subsection 7.9.2.6, "Cyber Security," and Subsection 7.9.4, "Combined License Information."

While many of the features, acceptance criteria, and fundamental features of reliable I&C hardware and software design significantly help protect against the defeat of accomplishing a safety function by unintentional human errors and support the cyber security criteria, cyber security goes beyond hardware and software design and includes procedural and operational aspects. Cyber security is not addressed in SRP Chapter 7. The Cyber Security Plan is submitted to the NRC as described in Section 13.6. Technical evaluation of the Cyber Security plan is documented in Section 13.6 of this SE. Therefore, FSAR, Revision 3, removed all of the previous content in Section 7.9 and now incorporates by reference Section 7.9 of the US-APWR DCD with no departures or supplements.

Section 7.9, "Data Communications Systems, " of the CPNPP, Units 3 and 4, COL FSAR, Part 2, Revision 3, incorporates by reference, with no departures or supplements, Section 7.9, "Data

Communications Systems," of the US-APWR DCD, Revision 3. The staff is reviewing the information in US-APWR DCD Section 7.9, "Data Communications Systems," under Docket Number 52-021. The results of the staff's technical evaluation of the information related to the data communications systems incorporated by reference in the CPNPP, Units 3 and 4, COL FSAR will be documented in the staff's FSER on the DC application for the US-APWR.

The SE for the US-APWR DC application is not yet complete, and this is being tracked as part of **Open Item 1-1**. The staff will update Section 7.9, "Data Communications Systems," of this SE to reflect the final disposition of the DC application design.