FINAL SAFETY ANALYSIS REPORT

CHAPTER 7

INSTRUMENTATION AND CONTROLS

7.0 INSTRUMENTATION AND CONTROLS

This chapter of the U.S. EPR Final Safety Analysis Report (FSAR) is incorporated by reference with supplements as identified in the following sections.

7.1 INTRODUCTION

This section of the U.S. EPR FSAR is incorporated by reference }with the following supplement}.

{U.S. EPR FSAR Table 7.1-5, SAS Automatic Safety Function, is supplemented by Table 7.1-1 which provides comparable information for site-specific safety-related instrument and control functions.}

Table 7.1-1— {SAS Automatic Safety Function (Site-Specific) Sheet 1 of 1

System[1]	Function Name [2]	Function Safety Base[3]	Interdivision Communications [4]	Type of Data[5]	Signal Selection Type[6]	Comments
UHS Makeup Water System	ESWS emergency Makeup Water alignment	This function is described in Section 9.2.5.7.3	NO	NA	NA	

Notes:

1. System – Mechanical system described in the referenced FSAR section.
2. Function Name – The automatic safety-related function is controlled by SAS in each mechanical system.
3. Function Safety Basis – Safety-related functions that provide reasonable assurance of either:
   - The integrity of the reactor coolant pressure boundary.
   - The capability to shut down the reactor and maintain it in a safe shutdown condition.
   - The capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures.
4. Interdivisional Communication – Point-to-point data communications between different safety divisions of SAS.
5. Type of Data – Analog or Discrete Signal. This column is meant to indicate the type of information sent between divisions, not the transmission means by which the information is sent (hardwired, data message, etc.).
6. Signal Selection Type – Vote. Vote is defined as:
   - 1 out of x, where x is the number of inputs to the logic block. If one or more inputs is TRUE, then the output will be TRUE. This logic may be implemented with an OR gate.
   - x out of x, where x is the number of inputs to the logic block. If x number of inputs are TRUE, then the output will be TRUE. This logic may be implemented using an AND gate.
   - y out of x, where x is the number of inputs to the logic block and y is a value between 2 and x. If the number of inputs equal or greater than y is TRUE, then the output will be TRUE.
   - Interdivisional voting requires one or more inputs to a logic block to originate from multiple divisions.

7.1.1 U.S. EPR I&C Systems

{No departures or supplements.}

7.1.1.1 Overview

{No departures or supplements.}

7.1.1.2 Use of TELEPERM XS in the U.S. EPR

{No departures or supplements.}

7.1.1.3 TXS Platform Design

{No departures or supplements.}

7.1.1.3.1 Application of the TXS Platform

A COL applicant that references the U.S. EPR design certification will establish a plan to address the site-specific implementation of the limitations and conditions identified in Section

4 of the NRC Safety Evaluation for Topical Report ANP- 10272A, "Software Program Manual for TELEPERM XS Safety Systems."

This COL Item is addressed as follows:

A plan shall be established to address the site-specific implementation of the limitations and conditions identified in Section 4 of the NRC Safety Evaluation for Topical Report ANP-10272A, "Software Program Manual for TELEPERM XS Safety Systems" and make it available for NRC review prior to project specific TXS software development.

7.2 REACTOR TRIP SYSTEM

This section of the U.S. EPR FSAR is incorporated by reference.

7.3 ENGINEERED SAFETY FEATURES SYSTEMS

This section of the U.S. EPR FSAR is incorporated by reference.

7.4 SYSTEMS REQUIRED FOR SAFE SHUTDOWN

This section of the U.S. EPR FSAR is incorporated by reference. {with the following supplements}.

7.4.1 Description

{U.S. EPR FSAR Section 7.4.1.2 is supplemented with Table 7.4-1 and Table 7.4-2 and Subsection 7.4.1.2.12 of the U.S. EPR FSAR is supplemented with the UHS Makeup Water Intake Structure Ventilation System. Also U.S. EPR FSAR Section 7.4.1.2 is supplemented with Subsection 7.4.1.2.14 for the site-specific UHS Makeup Water System.}

7.4.1.1 I&C Systems Associated with Safe Shutdown

{No departures or supplements.}

7.4.1.2 Safe Shutdown Using Safety-Related Systems and Equipment

This section of the U.S. EPR FSAR is incorporated by reference {with the following supplement.}

{Table 7.4-1 and Table 7.4-2 show the site-specific component and monitoring functions used to achieve safe shutdown. Each site-specific component listed in Table 7.4-1 is provided with four fully redundant and independent trains of safe shutdown components to satisfy the single failure criteria.}

7.4.1.2.1 Emergency Feedwater System

{No departures or supplements.}

7.4.1.2.2 Main Steam System

{No departures or supplements.}

7.4.1.2.3 Medium Head Safety Injection

{No departures or supplements.}

7.4.1.2.4 Extra Borating System

{No departures or supplements.}

7.4.1.2.5 Residual Heat Removal System

{No departures or supplements.}

7.4.1.2.6 Excore Instrumentation System

{No departures or supplements.}

7.4.1.2.7 Reactor Coolant System

{No departures or supplements.}

7.4.1.2.8 Emergency Diesel Generators and Auxiliaries

{No departures or supplements.}

7.4.1.2.9 Essential Service Water System

{No departures or supplements.}

7.4.1.2.10 Component Cooling Water System

{No departures or supplements.}

7.4.1.2.11 Safety Chilled Water System

{No departures or supplements.}

7.4.1.2.12 Heating Ventilation and Air Conditioning Systems

This section of the U.S. EPR FSAR is incorporated by reference {(with the following supplement.)}

{The site-specific HVAC systems that provide ambient temperature control for the systems and components necessary for safe shutdown include the following system.

- UHS Makeup Water Intake Structure Ventilation System}

7.4.1.2.13 Power Distribution System

{No departures or supplements.}

7.4.1.2.14 {UHS Makeup Water System

The UHS Makeup Water System provides Chesapeake Bay makeup water to the UHS cooling tower basin 72-hours post design basis accident, when the normal makeup water system is not available to maintain the minimum water level of the UHS cooling tower basin.}

The I&C associated with the UHS Makeup Water System is described in Section 9.2.5.}

7.4.2 References

{No departures or supplements.}

Table 7.4-1— Site-Specific Component Controls for Shutdown

Components	Normal Shutdown	Safe/DBA Shutdown	FSAR Section Reference
Makeup Water Pump	No	Yes	9.2.5
Pump Discharge Isolation Valve	No	Yes	9.2.5
Pump Minimum Flow Valve	No	Yes	9.2.5
Pump Discharge Strainer Blowdown Isolation Valve	No	Yes	9.2.5
Traveling Screen	No	Yes	9.2.5
Traveling Screen Wash Isolation Valve	No	Yes	9.4.15
Pump/Electrical Room Air Handling Unit	No	Yes	9.4.15
Pump/Electrical Room Air Cooled Condenser	No	Yes	9.4.15
Pump/Electrical Room Exhaust Fan	No	No	9.4.15
Personnel Access to Electrical /Pump Rooms Supply Fan	No	No	9.4.15
Personnel Access to Electrical /Pump Rooms Exhaust Fan	No	No	9.4.15
Traveling Screen Room Exhaust Fan	No	Yes	9.4.15
Traveling Screen Room Unit Heater	No	Yes	9.4.15
Traveling Screen Room Air Inlet Isolation Damper	No	Yes	9.4.15

Table 7.4-2— Site-Specific Indication for Shutdown

Components	Normal Shutdown	Safe/DBA Shutdown	FSAR Section Reference
Pump Discharge Pressure	No	Yes	9.2.5
Pump Discharge Flow	No	Yes	9.2.5
Pump Discharge Strainer Differential Pressure	No	Yes	9.2.5
Traveling Screen Differential Level	No	Yes	9.2.5
Screen Wash Supply Pressure	No	Yes	9.2.5
Pump Forebay Level	No	Yes	9.2.5

7.5 INFORMATION SYSTEMS IMPORTANT TO SAFETY

This section of the U.S. EPR FSAR is incorporated by reference with the following supplements.

7.5.1 Description

No departures or supplements.

7.5.2 Analysis

No departures or supplements.

7.5.2.1 Acceptance Criteria

No departures or supplements.

7.5.2.2 Discussion

No departures or supplements.

7.5.2.2.1 Conformance to Regulatory Guide 1.97 and BTP 7-10

The U.S. EPR FSAR includes the following COL Item in Section 7.5.2.2.1:

A COL applicant that references the U.S. EPR design certification will identify the need for any site-specific PAM variables.

This COL Item is addressed as follows:

{The site-specific PAM variables are identified in Table 7.5-1, Inventory of Post Accident Monitoring Variables. This table is a supplement to U.S. EPR Table 7.5-1.}

7.5.2.2.2 Use of Digital Systems

No departures or supplements.

7.5.2.2.3 Monitoring for Severe Accidents

No departures or supplements.

7.5.2.2.4 Conformance to Regulatory Guide 1.47

No departures or supplements.

7.5.2.2.5 Scope of Bypassed and Inoperable Status Indications

No departures or supplements.

7.5.2.2.6 Redundancy and Diversity of Display

No departures or supplements.

7.5.2.2.7 Independence and Compliance with IEEE Std 603-1998

No departures or supplements.

7.5.3 References

No departures or supplements.

Table 7.5-1— {Inventory of Post Accident Monitoring Variables}

No.	Variable	Range	Minimum Channel Required	Duration	Safety Class	EQ per IEEE Std. 323-1974	Seismic Qualification	Type				
								A	B	C	D	E
1	Essential Service Water System (ESWS) Cooling Tower Basin Level	9' to 26'	2	30 days	S	No	I	x				
2	Meteorological Monitoring System Wind Speed - 10 meters	0-100 mph	1	30 days	NS	No	NSC					x
3	Meteorological Monitoring System Wind Speed - 60 meters	0-100 mph	1	30 days	NS	No	NSC					x
4	Meteorological Monitoring System Wind Direction - 10 meters	0° - 360°	1	30 days	NS	No	NSC					x
5	Meteorological Monitoring System Wind Direction - 60 meters	0° - 360°	1	30 days	NS	No	NSC					x
6	Meteorological Monitoring System Vertical Temperature Difference - between 10 and 60 meters	-50°C to +50°C	1	30 days	NS	No	NSC					x

7.6 INTERLOCK SYSTEMS IMPORTANT TO SAFETY

This section of the U.S. EPR FSAR is incorporated by reference.

7.7 CONTROL SYSTEMS NOT REQUIRED FOR SAFETY

This section of the U.S. EPR FSAR is incorporated by reference.

7.7.1 Description

No departures or supplements.

7.7.2 Design Basis Information

No departures or supplements

7.7.2.1 Operational Core Control Functions

No departures or supplements.

7.7.2.2 Operational Plant Control Functions

No departures or supplements.

7.7.2.3 Process Limitation I&C Functions

No departures or supplements.

7.7.2.3.1 Loss of One Reactor Coolant Pump Limitation

No departures or supplements.

7.7.2.3.2 Axial Offset Limitation

No departures or supplements.

7.7.2.3.3 Reactor Power Limitation with Respect to Feedwater Flow Rate

No departures or supplements.

7.7.2.3.4 Reactor Power Limitation with Respect to Generator Power

No departures or supplements.

7.7.2.3.5 Reactor Power Limitation with Respect to Thermal Power

The U.S. EPR FSAR includes the following COL Item in Section 7.7.2.3.5:

> A COL applicant that references the U.S. EPR design certification will, following selection of the actual plant operating instrumentation and calculation of the instrumentation uncertainties of the operating plant parameters, calculate the primary power calorimetric uncertainty. The calculations will be completed using an NRC acceptable method and confirm that the safety analysis primary power calorimetric uncertainty bounds the calculated values.

The COL Item is addressed as follows:

> Following selection of the actual plant operating instrumentation and calculation of the instrumentation uncertainties of the operating plant parameters, the primary power calorimetric uncertainty will be calculated. The calculations shall be completed using an NRC acceptable method and shall confirm that the safety analysis primary power calorimetric uncertainty bounds the calculated values.

7.7.2.3.6 Rod Drop Limitation

No departures or supplements.

7.7.2.3.7 Intermediate Range High Neutron Flux Limitation

No departures or supplements.

7.7.2.3.8 High Linear Power Density Limitation

No departures or supplements.

7.7.2.3.9 Low Departures from Nucleate Boiling Limitation

No departures or supplements.

7.7.2.3.10 RCS Dilution (Shutdown Condition) Limitation

No departures or supplements.

7.7.2.3.11 Reactor Coolant System Pressure Limitations

No departures or supplements.

7.7.2.3.12 Pressurizer Level Limitations

No departures or supplements.

7.7.2.3.13 Reactor Coolant System Loop Level Limitation

No departures or supplements.

7.7.2.3.14 Steam Generator Level Limitations

No departures or supplements.

7.7.2.4 Non-Safety Control Systems Described in Other Sections

No departures or supplements.

7.7.2.5 Safety Classification

No departures or supplements.

7.7.2.6 Effects of Control System Operation Upon Accidents

No departures or supplements.

7.7.2.7 Effects of Control System Failures

No departures or supplements.

7.7.2.8 Environmental Control System

No departures or supplements.

7.7.2.9 Independence

No departures or supplements.

7.7.2.10 Interactions between Safety-Related and Non Safety-Related I&C Systems

No departures or supplements.

7.7.2.11 Defense in Depth and Diversity

No departures or supplements.

7.7.2.12 Potential for Inadvertent Actuation

No departures or supplements.

7.7.2.13 Control of Access

No departures or supplements.

7.8 DIVERSE I&C SYSTEMS

This section of the U.S. EPR FSAR is incorporated by reference.

7.9 DATA COMMUNICATION SYSTEMS

This section of the U.S. EPR FSAR is incorporated by reference.