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ENCLOSURE 2

APP-GW-GLN-022-NS, Revision 1

"AP1000 Standard Combined License Technical Report DAS Platform Technology and Remote Indication Change"

Technical Report 97

Public Version

Redacted version of Enclosure 1 with sensitive unclassified non-safeguards information related to the physical protection of an AP1000 Nuclear Plant withheld from public disclosure pursuant to 10 CFR 2.390(d)

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AP1000

Standard Combined License Technical Report DAS Platform Technology and Remote Indication Change

APP-GW-GLN-022-NS, Rev. 1

This document has sensitive unclassified nonsafeguard information related to the physical protection of an AP1000 Nuclear Plant redacted pursuant to 10CFR2.390(d).

May 2007

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RECORD OF CHANGES

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A	M. Cernuska	Initial version of APP-GW-GLN-022	2/07
0	M. Cernuska	Addressed review comments of APP-GW-GLN-022.	4/07
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TABLE OF CONTENTS

TABLE OF CONTENTS (Cont'd)

LIST OF TABLES

LIST OF FIGURES

ACRONYMS AND TRADEMARKS

Acronyms used in the document are defined in WNA-PS-00016-GEN, "Westinghouse RRAS Standard Acronyms and Definitions" (Reference 1), or defined below to ensure unambiguous understanding of their use within this document.

GLOSSARY OF TERMS

Terms used in the document are defined in WNA-PS-00016-GEN, "Westinghouse RRAS Standard Acronyms and Definitions" (Reference 1), or defined below to ensure unambiguous understanding of their use within this document.

REFERENCES

Following is a list of references used throughout this document.

1. WNA-PS-00016-GEN, Rev. 1, "Westinghouse RRAS Standard Acronyms and Definitions," Westinghouse Electric Company LLC.

2. APP-GW-GL-700, Rev. 15, "AP1000 Design Control Document," Westinghouse Electric Company LLC.

3. NUREG-1793, Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design, United States Nuclear Regulatory Commission.

(Last Page of Front Matter)

SECTION 1
INTRODUCTION

This technical report describes two sets of changes to the AP1000 Design Control Document (DCD) (Reference 2):

- Changes to address damage to the northern portion of the auxiliary building – A large fire or explosion affecting the northern[1] section of the auxiliary building could [ ][SRI] This technical report describes an implementation for limited indication and plant control capabilities. These capabilities permit long-term decay heat removal and plant stability in a manner that is physically separated from the northern section of the auxiliary building. This is accomplished by [ ][SRI] to provide these functions.

- Changes to allow non-microprocessor-based implementations – The design commitment of Revision 15 of the AP1000 DCD (Reference 2) states that the DAS automatic actuation processor is based upon microprocessor technology. Given current processor design choices, it is not prudent to limit the design to only digital microprocessor based platforms. The proposed language change to the DCD would leave microprocessor platforms as a valid option, but would also allow alternate technologies. The change is implemented throughout Tier 1 and Tier 2 of the DCD by substituting language, as appropriate, where the terms "microprocessor" and "software" are used to describe DAS technology. The term "microprocessor" is replaced with "microprocessor or special purpose logic processor." The term "software" is replaced with "any software."

[1]Directions in this report (north, northern, south, etc.) refer to the standard AP1000 coordinate system where north is towards the turbine building from the centerline of containment.

[SRI] Security-Related information, withheld under 10CFR2.390(d).

(Last Page of Section 1)

SECTION 2
TECHNICAL BACKGROUND

In Revision 15 of the AP1000 DCD (Reference 2), the four divisions (A, B, C, and D) of the Protection and Safety Monitoring System (PMS) and Class 1E DC and Uninterruptible Power Supply System (IDS), electrical containment penetrations, methods of Plant Control System (PLS) instrumentation and control, the main control room, and the remote shutdown workstation are concentrated [ ][SRI] A large fire or explosion could render these features unusable for a significant amount of time. Such an event would most likely result in an immediate plant scram due to the loss of power and control functions; however, most of the plant instrumentation and control (I&C) would be unavailable.

[

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-
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][SRI]

2.1 PHYSICAL PLANT CONFIGURATION IMPACT

[ ][SRI]

[ ][SRI]

[SRI] Security-Related information, withheld under 10CFR2.390(d).

[

]SRI

2.2 INSTRUMENTATION IMPACT

DAS provides 14 selected indications that are most critical to post scram plant stability. These indications are provided via a hard-wired 4-20 mA signal directly from the process instrument to the DAS display meters. The in-core thermocouple signals are converted to 4-20 mA signals in the DAS Instrumentation Cabinet (DAS-JD-004). The DAS Instrumentation Cabinet displays a duplicate set of the 14 parameters displayed on the DAS control panel in the main control room (MCR).

The 4-20 mA instrumentation loops continue to function if they are [

]SRI This is accomplished by routing the entire instrumentation loop from the instruments inside containment, to the power supply in the DAS instrumentation cabinet, to the instruments in the DAS Instrumentation Cabinet, to the DAS processing cabinets in Computer Room A, to the DAS control panel in the MCR, and finally back to the instruments inside of containment. [

]SRI

2.3 POWER/ACTUATION IMPACT

A UPS is needed to provide continuity of power for the DAS Instrumentation Cabinet (DAS-JD-004) when power from normal sources is lost. The UPS is of a flexible design so that the [

]SRI

In the unlikely circumstance that a large fire of explosion in the northern auxiliary building occurs simultaneously with a primary coolant leak or loss of coolant accident (LOCA), a means for complete depressurization of the plant to allow for passive decay heat removal is necessary. For this reason, an [

]SRI

SRI Security-Related information, withheld under 10CFR2.390(d).

(Last Page of Section 2)

SECTION 3
REGULATORY IMPACT

3.1 FINAL SAFETY EVALUATION REPORT IMPACT

The Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design (NUREG-1793) (Reference 3) describes DAS as a microprocessor based system, with different microprocessors, software, and architecture than the PMS. This is implemented to prevent a common mode failure between the DAS and PMS. The current design commitment states that the DAS automatic actuation processor will be microprocessor technology. This document, APP-GW-GLN-022, changes the descriptive language in the design commitment so that microprocessor platforms would be a valid option for DAS automatic functions, but would also allow alternate technologies.

The description of the DAS in the FSER needs to be revised, as appropriate, where the terms "microprocessor" and "software" are used to describe DAS technology. The term "microprocessor" should be replaced with "microprocessor or special purpose logic processor." The term "software" should be replaced with "any software." The following sections are affected:

- Section 7.7.2 (Page 7-68)
- Section 14.3.3.1 (Page 14-58)
- Section 19.1.18.14 (Page 19-115)

3.2 SCREENING QUESTIONS

The questions and responses below address the nuclear regulatory impact of the proposed changes.

1.	Does the proposed change involve a change to a structure, system, or component (SSC) that adversely affects a DCD described design function?	☐ YES	☒ NO
	The automatic and manual functions of the DAS are not adversely affected by APP-GW-GLN-022.		
2.	Does the proposed change involve a change to a procedure that adversely affects how DCD described SSC design functions are performed or controlled?	☐ YES	☒ NO
	The designed control functions of the DAS SSCs are not impacted, nor adversely affected, by APP-GW-GLN-022.		
3.	Does the proposed activity involve revising or replacing a DCD described evaluation methodology that is used in establishing the design bases or used in the safety analyses?	☐ YES	☒ NO
	The safety analysis or design basis evaluation methodology of the DAS are not impacted, nor adversely affected, by APP-GW-GLN-022.		
4.	Does the proposed activity involve a test or experiment not described in the DCD, where an SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the DCD?	☐ YES	☒ NO
	The DAS design changes as described in APP-GW-GLN-022 do not require an additional test or experiment where a DAS SSC is utilized or controlled in a manner that is outside the reference bounds of the design for that SSC or is inconsistent with analyses or descriptions in the DCD.		

3.3 EVALUATION OF DEPARTURE FROM TIER 2 INFORMATION

10 CFR Part 52, Appendix D, Section VIII., paragraph B.5.a. provides that an applicant for a combined license who references the AP1000 design certification may depart from Tier 2 information, without prior Nuclear Regulatory Commission (NRC) approval, if it does not require a license amendment under paragraph B.5.b. The questions and responses below address the criteria of paragraph B.5.b.

1.	Does the proposed departure result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the plant-specific DCD?	☐ YES ☒ NO
	The DAS design changes described in APP-GW-GLN-022 does not increase the frequency of occurrence of an accident because there is no significant increase in the probability of failure of DAS SSCs due to the design changes.	
2.	Does the proposed departure result in more than a minimal increase in the likelihood of occurrence of a malfunction of a structure, system, or component (SSC) important to safety and previously evaluated in the plant-specific DCD?	☐ YES ☒ NO
	The DAS changes described in APP-GW-GLN-022 do not increase the probability of malfunctions to the DAS SSCs.	
3.	Does the proposed departure result in more than a minimal increase in the consequences of an accident previously evaluated in the plant-specific DCD?	☐ YES ☒ NO
	The DAS design changes proposed in APP-GW-GLN-022 do not increase the consequences of a previously evaluated accident.	
4.	Does the proposed departure result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the plant-specific DCD?	☐ YES ☒ NO
	The DAS design changes proposed in APP-GW-GLN-022 do not increase the consequences of a malfunction in a previously evaluated SSC important to safety.	
5.	Does the proposed departure create a possibility for an accident of a different type than any evaluated previously in the plant-specific DCD?	☐ YES ☒ NO
	The DAS design changes proposed in APP-GW-GLN-022 do not create a possibility for an accident of a different type than any previously evaluated accident.	
6.	Does the proposed departure create a possibility for a malfunction of an SSC important to safety with a different result than any evaluated previously in the plant-specific DCD?	☐ YES ☒ NO
	The DAS design changes proposed in APP-GW-GLN-022 do not create a possibility for a malfunction of an SSC important to safety with a different result than any previously evaluated accident.	

7.	Does the proposed departure result in a design basis limit for a fission product barrier as described in the plant-specific DCD being exceeded or altered?	☐ YES ☒ NO
	The DAS design changes proposed in APP-GW-GLN-022 do not result in a design basis limit for a fission product barrier being exceeded or altered.	
8.	Does the proposed departure result in a departure from a method of evaluation described in the plant-specific DCD used in establishing the design bases or in the safety analyses?	☐ YES ☒ NO
	The DAS design changes proposed in APP-GW-GLN-022 do not result in a departure from the method of evaluation used in establishing the design bases or safety analyses.	
☒	The answers to the evaluation questions above are "NO" and the proposed departure from Tier 2 does not require prior NRC review to be included in plant specific Final Safety Analysis Reports (FSARs) as provided in 10 CFR Part 52, Appendix D, Section VIII., paragraph B.5.b.	
☐	One or more of the answers to the evaluation questions above are "YES" and the proposed change requires NRC review.	

3.4 IMPACT ON RESOLUTION OF A SEVERE ACCIDENT ISSUE

10 CFR Part 52, Appendix D, Section VIII., paragraph B.5.a. provides that an applicant for a combined license who references the AP1000 design certification may depart from Tier 2 information, without prior NRC approval, if it does not require a license amendment under paragraph B.5.c. The questions below address the criteria of paragraph B.5.c.

1.	Does the proposed activity result in an impact to features that mitigate severe accidents. If the answer is Yes answer Questions 2 and 3 below.	☐ YES ☒ NO
	The DAS design changes proposed in APP-GW-GLN-022 do not impact a feature that mitigates severe accidents.	
2.	Is there is a substantial increase in the probability of a severe accident such that a particular severe accident previously reviewed and determined to be not credible could become credible?	☐ YES ☐ NO ☒ N/A
3.	Is there is a substantial increase in the consequences to the public of a particular severe accident previously reviewed?	☐ YES ☐ NO ☒ N/A
☒	The answers to the evaluation questions above are "NO" or are not applicable and the proposed departure from Tier 2 does not require prior NRC review to be included in plant specific FSARs as provided in 10 CFR Part 52, Appendix D, Section VIII., paragraph B.5.c.	
☐	One or more of the he answers to the evaluation questions above are "YES" and the proposed change requires NRC review.	

3.5 SECURITY ASSESSMENT

The questions and responses below address the security assessment of the proposed changes.

1.	Does the proposed change have an adverse impact on the security assessment of the AP1000?	☐ YES ☒ NO
	The DAS design changes proposed in APP-GW-GLN-022 do not alter requirements for security personnel. Therefore, APP-GW-GLN-022 does not have an adverse impact on the security assessment of the AP1000.	

(Last Page of Section 3)

SECTION 4
DCD CHANGES

The following sections, tables, and figures in the DCD are impacted by the APP-GW-GLN-022 technical report. The affected sections are an exact copy of the DCD. Insertion text changes are represented by underlining. Deletion text changes are represented by ~~strikethrough~~.

- Tier 1
  - Table 2.2.1-1
  - Table 2.5.1-4
  - Table 2.5.1-5
  - Table 3.7-1
  - Figure 2.2.1-1
  - Section 2.5.1

- Tier 2
  - Figure 1.2-8
  - Figure 1.2-9
  - Figure 6.2.5-1
  - Figure 7.2-1 (Sheet 19 & 20)
  - Section 7.7.1.11
  - Section 9A.3.1.2.6.1
  - Section 9A.3.1.3.1.1
  - Table 9A-3
  - Table 14.3-3
  - Table 14.3-6
  - Table 17.4-1
  - Table 19.59-18

4.1 TIER 1 DCD CHANGES

4.1.1 Table 2.2.1-1

Add the following row to Table 2.2.1-1

Table 2.2.1-1

Equipment Name	Tag No.	ASME Code Section III	Seismic Cat. I	Remotely Operated Valve	Class 1E/ Qual. for Harsh Envir.	Safety-Related Display	Control PMS/DAS	Active Function	Loss of Motive Power Position
Electrical Penetration P03	DAS-EY-P03Z	Yes	Yes	–	No/Yes	–	–/–	–	–

4.1.2 Figure 2.2.1-1

Revise Figure 2.2.1-1 as follows:

Add representation for the new DAS electrical containment penetration.

4.1.3 Section 2.5.1

Revise Section 2.5.1 as follows:

2.5.1 Diverse Actuation System

Design Description

The diverse actuation system (DAS) initiates reactor trip, actuates selected functions, and provides plant information to the operator.

The component locations of the DAS are as shown in Table 2.5.1-5.

1. The functional arrangement of the DAS is as described in the Design Description of this Section 2.5.1.

2. The DAS provides the following nonsafety-related functions:

   a. The DAS provides an automatic reactor trip on low wide-range steam generator water level or on low pressurizer water level separate from the PMS.

   b. The DAS provides automatic actuation of selected functions, as identified in Table 2.5.1-1, separate from the PMS.

   c. The DAS provides manual initiation of reactor trip and selected functions, as identified in Table 2.5.1-2, separate from the PMS. These manual initiation functions are implemented in a manner that bypasses the control room multiplexers, the PMS cabinets, and the signal processing equipment of the DAS.

   d. The DAS provides main control room (MCR) displays of selected plant parameters, as identified in Table 2.5.1-3, separate from the PMS.

3. The DAS has the following features:

   a. The signal processing hardware of the DAS uses input modules, output modules, and microprocessor <u>or special purpose logic processor</u> boards that are different than those used in the PMS.

   b. The display hardware of the DAS uses a different display device than that used in the PMS.

c. ~~Software used in the DAS uses an~~ Any operating systems ~~and a~~ or programming languages used by DAS ~~that~~ are different than those used in the PMS.

d. The DAS has electrical surge withstand capability (SWC), and can withstand the electromagnetic interference (EMI), radio frequency (RFI), and electrostatic discharge (ESD) conditions that exist where the DAS equipment is located in the plant.

e. The sensors identified on Table 2.5.1-3 are used for DAS input and are separate from those being used by the PMS and plant control system.

f. The DAS is powered by non-Class 1E uninterruptible power supplies that are independent and separate from the power supplies which power the PMS.

g. The DAS signal processing cabinets are provided with the capability for channel testing without actuating the controlled components.

h. The DAS equipment can withstand the room ambient temperature and humidity conditions that will exist at the plant locations in which the DAS equipment is installed at the times for which the DAS is designed to be operational.

4. The DAS hardware and any software is developed using a planned design process which provides for specific design documentation and reviews during the following life cycle stages:

   a. Design requirements phase

   b. System definition phase

   c. Development phase for hardware and any software ~~Hardware and software development phase~~

   d. System test phase

   e. Installation phase

The planned design process also provides for the use of commercial off-the-shelf hardware and software.

4.1.4 Table 2.5.1-4

Table 2.5.1-4 specifies the inspections, tests, analyses, and associated acceptance criteria for the DAS.

Revise Table 2.5.1-4 as follows:

Table 2.5.1-4. Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
3.a. The signal processing hardware of the DAS uses input modules, output modules, and microprocessor or special purpose logic processor boards that are different than those used in the PMS.	Inspection of the as-built DAS and PMS signal processing hardware will be performed.	The DAS signal processing equipment uses input modules, output modules, and microprocessor or special purpose logic processor boards that are different than those used in the PMS. The difference may be a different design, use of different component types, or different manufacturers.
3.b. The display hardware of the DAS uses a different display device than that used in the PMS.	Inspection of the as-built DAS and PMS display hardware will be performed.	The DAS display hardware is different than the display hardware used in the PMS. The difference may be a different design, use of different component types, or different manufacturers.
3.c. ~~Software used in the DAS uses an~~ Any operating systems ~~and a~~ or programming languages used by DAS ~~that~~ are different than those used in the PMS.	Inspection of the DAS and PMS design documentation will be performed.	~~The~~ Any DAS operating systems and programming languages are different than those used in the PMS.
3.d. The DAS has electrical surge withstand capability (SWC), and can withstand the electromagnetic interference (EMI), radio frequency (RFI), and electrostatic discharge (ESD) conditions that exist where the DAS equipment is located in the plant.	Type tests, analyses, or a combination of type tests and analyses will be performed on the equipment.	A report exists and concludes that the DAS equipment can withstand the SWC, EMI, RFI and ESD conditions that exist where the DAS equipment is located in the plant.
3.e. The sensors identified on Table 2.5.1-3 are used for DAS input and are separate from those being used by the PMS and plant control system.	Inspection of the as-built system will be performed.	The sensors identified on Table 2.5.1-3 are used by DAS and are separate from those being used by the PMS and plant control system.
3.f. The DAS is powered by non-Class 1E uninterruptible power supplies that are independent and separate from the power supplies which power the PMS.	Electrical power to the PMS equipment will be disconnected. While in this configuration, a test will be performed by providing simulated test signals in the non-Class 1E uninterruptible power supplies.	A simulated test signal exists at the DAS equipment when the assigned non-Class 1E uninterruptible power supply is provided the test signal.
3.g. The DAS signal processing	Channel tests will be performed on	The capability exists for testing

Table 2.5.1-4. Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
cabinets are provided with the capability for channel testing without actuating the controlled components.	the as built system.	individual DAS channels without propagating an actuation signal to a DAS controlled component.
3.h. The DAS equipment can withstand the room ambient temperature and humidity conditions that will exist at the plant locations in which the DAS equipment is installed at the times for which the DAS is designed to be operational.	Type tests, analyses, or a combination of type tests and analyses will be performed on the equipment.	A report exists and concludes that the DAS equipment can withstand the room ambient temperature and humidity conditions that will exist at the plant locations in which the DAS equipment is installed at the times for which the DAS is designed to be operational.
4. The DAS hardware and any software is developed using a planned design process which provides for specific design documentation and reviews during the following life cycle stages: a. Design requirements phase b. System definition phase c. Development phase for hardware and any software ~~Hardware and software development phase~~ d. System test phase e. Installation phase The planned design process also provides for the use of commercial off-the-shelf hardware and software.	Inspection will be performed of the process used to design the hardware and any software.	A report exists and concludes that the process defines the organizational responsibilities, activities, and configuration management controls for the following: a. Establishments of plans and methodologies during the design requirements phase. b. Specification of functional requirements during the system definition phase. c. Documentation and review of hardware and any software. ~~during the hardware and software development phase~~. d. Performance of tests and the documentation of test results during the system test phase. e. Performance of tests and inspections during the installation phase. The process also defines requirements for the use of commercial off-the-shelf hardware and software, if used.

4.1.5 Table 2.5.1-5

Revise Table 2.5.1-5 as follows:

Table 2.5.1-5

Component Name	Tag No.	Component Location
DAS Processor Cabinet 1	DAS-JD-001	Annex Building
DAS Processor Cabinet 2	DAS-JD-002	Annex Building
DAS Squib Valve Control Cabinet	DAS-JD-003	Auxiliary Building
DAS Instrumentation Cabinet	DAS-JD-004	Auxiliary Building

4.1.6 Table 3.7-1

Revise Table 3.7-1 as follows:

Table 3.7-1 Risk-Significant Components

Equipment Name	Tag No.
Component Cooling Water System (CCS)	
Component Cooling Water Pumps	CCS-MP-01A/B
Containment System (CNS)	
Containment Vessel	CNS-MV-01
Hydrogen Igniters	VLS-EH-1 through -64
Chemical and Volume Control System (CVS)	
Makeup Pumps	CVS-MP-01A/B
Makeup Pump Suction and Discharge Check Valves	CVS-PL-V113 CVS-PL-V160A/B
Diverse Actuation System (DAS)	
DAS Processor Cabinets and Control Panel (used to provide automatic and manual actuation)	DAS-JD-001 DAS-JD-002 DAS-JD-004 OCS-JC-020
Annex Building UPS Distribution Panels (provide power to DAS)	EDS1-EA-1, EDS1-EA-14, EDS2-EA-1, EDS2-EA-14

4.2 TIER 2 DCD CHANGES

4.2.1 Figure 1.2-8

Revise Figure 1.2-8 as follows:

Add representation for the added DAS electrical containment penetrations and cabinet configuration.

4.2.2 Figure 1.2-9

Revise Figure 1.2-9 as follows:

Add representation for the added DAS electrical containment penetrations and cabinet configuration.

4.2.3 Figure 6.2.5-1

Revise Figure 6.2.5-1 as follows:

Add representation for the new DAS electrical containment penetration.

4.2.4 Figure 7.2-1

Revise Figure 7.2-1 (Sheet 19) as follows:

Add Note 2 to read: "Note 2. Indication is provided in the main control room and at the DAS instrumentation cabinet."

4.2.5 Figure 7.2-1

Revise Figure 7.2-1 (Sheet 20) as follows:

Revise Note 4 to read: "Note 4. Logical "and" function performed by squib valve controller. Additional manual squib valve capability provided at the squib valve control panel."

Add Note 5 to read: "Note 5. Indication is provided in the main control room and at the DAS instrumentation cabinet."

4.2.6 Section 7.7.1.11

Revise Section 7.7.1.11 as follows:

7.7.1.11 Diverse Actuation System

The diverse actuation system is a nonsafety-related system that provides a diverse backup to the protection system. This backup is included to support the aggressive AP1000 risk goals by reducing the probability of a severe accident which potentially results from the unlikely coincidence of postulated transients and postulated common mode failure in the protection and control systems.

The protection and safety monitoring system is designed to prevent common mode failures. However, in the low probability case where a common mode failure does occur, the diverse actuation system provides diverse protection. The specific functions performed by the diverse actuation system are selected based on the PRA evaluation. The diverse actuation system functional requirements are based on an assessment of the protection system instrumentation common mode failure probabilities combined with the event probability.

The functional logic for the diverse actuation system is shown in Figure 7.2-1, sheets 19 and 20.

Automatic Actuation Function

The automatic actuation signals provided by the diverse actuation system are generated in a functionally diverse manner from the protection system actuation signals. The common-mode failure of sensors of a similar design is also considered in the selection of these functions.

The automatic actuation function is accomplished by redundant ~~microprocessor-based~~ logic subsystems. Input signals are received from the sensors by an input signal conditioning block, which consists of one or more electronic modules. This block converts the signals to standardized levels, provides a barrier against electromagnetic and radio frequency interference, and presents the resulting signal to the input signal conversion block. The conversion block continuously performs analog to digital signal conversions and stores the value for use by the signal processing block.

The signal processing block polls the various input signals ~~inputs under the control of a software-based algorithm~~, evaluates the input signals against stored setpoints, executes the ~~programmed~~ logic when thresholds are exceeded, and issues actuation commands.

The resulting output signals are passed to the output signal conversion block, whose function is to convert ~~microprocessor~~ logic states to parallel, low-level dc signals. These signals are passed to the output signal conditioning block. This block provides high-level signals capable of switching the traditional power plant loads, such as breakers and motor controls. It also provides a barrier against electromagnetic and radio frequency interference.

Diversity is achieved by the use of ~~a~~ different architectures, ~~different~~ hardware implementations, and ~~different~~ any software from that of the protection and safety monitoring system.

~~The diverse design uses standard input modules designed for use with small industrial computer systems. It also uses a microprocessor board different from those used in the protection system.~~

~~Software diversity~~ Diversity of any software is achieved by running different operating systems and programming in different languages.

The diverse automatic actuations are:

- Trip rods via the motor generator set, trip turbine, initiate the passive residual heat removal, actuate core makeup tanks, and trip the reactor coolant pumps on low wide-range steam generator water level

- Open the passive heat removal discharge isolation valves and close the in-containment refueling water storage tank gutter isolation valves on high hot leg temperature

- Trip rods via the motor generator set, trip turbine, actuate the core makeup tanks, and trip the reactor coolant pumps on low pressurizer water level

- Isolate selected containment penetrations and start passive containment cooling water flow on high containment temperature

The selection of setpoints and time responses determine that the automatic functions do not actuate unless the protection and safety monitoring system has failed to actuate to control plant conditions. Capability is provided for testing and calibrating the channels of the diverse actuation system.

Manual Actuation Function

*[The manual actuation function of the diverse actuation system is implemented by hard-wiring the controls located in the main control room directly to the final loads in a way that completely bypasses the normal path through the control room multiplexers, the protection and safety monitoring system cabinets, and the diverse actuation system automatic logic.]**

The diverse manual functions are:

- Reactor and turbine trip

- Passive containment cooling actuation

- Core makeup tank actuation and reactor coolant pump trip

- Open stage 1 automatic depressurization system valves

- Open stage 2 automatic depressurization system valves

- Open stage 3 automatic depressurization system valves

- Open stage 4 automatic depressurization system valves

- Open the passive residual heat removal discharge isolation valves and close the in-containment refueling water storage tank gutter isolation valves

- Selected containment penetration isolation
- Containment hydrogen igniter actuation
- Initiate in-containment refueling water storage tank injection
- Initiate containment recirculation
- Initiate in-containment refueling water storage tank drain to containment

In addition to the above functions, a redundant method of actuating the following components is provided at the DAS squib valve control cabinet:

- Open stage 4 automatic depressurization system valves
- Initiate in-containment refueling water storage tank injection
- Initiate containment recirculation
- Initiate in-containment refueling water storage tank drain to containment

Actuation Logic Function

There are two actuation logic modes, automatic and manual. The automatic actuation logic mode functions to logically combine the automatic signals from the two redundant automatic subsystems in a two-out-of-two basis. The combined signal operates a power switch with an output drive capability that is compatible, in voltage and current capacity, with the requirements of the final actuation devices. The two-out-of-two logic is implemented by connecting the outputs in series. The manual actuation mode operates in parallel to independently actuate the final devices.

Actuation signals are output to the loads in the form of normally de-energized, energize-to-actuate signals. The normally de-energized output state, along with the dual, two out of two redundancy reduces the probability of inadvertent actuation.

The diverse actuation system is designed so that, once actuated, each mitigation action goes to completion. Any subsequent return to operation requires deliberate operator action.

Indication

To support the diverse manual actuations, sensor outputs are displayed in the main control room in a manner that is diverse from the protection system display functions. The instrument sensor output displayed in the main control room is repeated at the DAS instrumentation cabinet. The indications that are provided from at least two sensors per function are:

- Steam generator water level – for reactor trip and passive residual heat removal actuations, and for overfill prevention by manual actuation of the automatic depressurization system valves
- Hot leg temperature – for passive residual heat removal actuation

- Core exit temperature – for automatic depressurization system actuation and subsequent initiation of in-containment refueling water storage tank injection and also containment hydrogen igniter actuation
- Pressurizer level – for core makeup tank actuation and reactor coolant pump trip
- Containment temperature – for containment isolation and passive containment cooling system actuation

Isolation

The diverse actuation system uses sensors that are separate from those being used by the protection and safety monitoring system and the plant control system. This prohibits failures from propagating to the other plant systems through the use of shared sensors.

There is signal isolation between the two subsystems within the diverse actuation system, one for each input and output path. These isolators are characterized by a high common mode voltage withstand capability to provide the necessary isolation against faults. The configuration is set up such that the isolation devices are capable of protecting against fault propagation between the diverse actuation system subsystems.

Actuation interfaces are shared between the diverse actuation system and the protection and safety monitoring system. The diverse actuation system actuation devices are isolated from the protection and safety monitoring system actuation devices, so as to avoid adverse interactions between the two systems. The actuation devices of each system are capable of independent operation that is not affected by the operation of the other. The diverse actuation system is designed to actuate components only in a manner that initiates the safety function. This type of interface also prevents the failure of an actuation device in one system from propagating a failure into the other system.

The diverse actuation system and the protection and safety monitoring system use independent and separate uninterruptible power supplies.

Operability, Availability, and Testing

The diverse actuation system is designed to provide protection under all plant operating conditions in which the reactor vessel head is in place and non-Class 1E UPS power is available. The automatic actuation processors, in each of the two redundant automatic subsystems of the diverse actuation system, are provided with the capability for channel calibration and testing while the plant is operating. To prevent inadvertent DAS actuations during online calibration, testing activities or maintenance, the normal activation function is bypassed. Testing of the diverse actuation system is performed on a periodic basis.

Equipment Qualification and Quality Standards

The diverse actuation system is located in a controlled environment, but is capable of functioning during and after normal and abnormal events and conditions that include:

- Wide temperature range of 40° to 120°F
- Noncondensing relative humidity up to 95 percent
- Radio frequency and electromagnetic interference

The diverse actuation system processor cabinets are located in the portion of the Annex Building that is a Seismic Category II structure. The diverse actuation system equipment, including actuated devices, is designed and tested in accordance with industry standards. The adequacy of the hardware and any software is demonstrated through the verification and validation program discussed in subsection 7.1.2.14. This program provides for the use of commercial off-the-shelf hardware and software. As the diverse actuation system performs many of the protection functions associated within the ATWS systems used in existing plants, the diverse actuation system is designed to meet the quality guidelines established by Generic Letter 85-06, "Quality Assurance Guidelines for ATWS Equipment that is not Safety-Related."

4.2.7 Section 9A.3.1.2.6.1

9A.3.1.2.6.1 Fire Area 1230 AF 02

The fire area is comprised of the following room:

Room No.

12321 Non-Class 1E equipment/penetration room

There are no systems in this fire area which normally contain radioactive material.

Fire Detection and Suppression Features

- Fire detectors
- Preaction sprinklers
- Hose station(s)
- Portable fire extinguishers

Smoke Control Features

The equipment room HVAC subsystem of the annex/auxiliary building non-radioactive ventilation system (VXS) servicing this fire area stops upon detection of smoke in the supply duct. Combination fire-smoke dampers close automatically in response to a smoke detector signal or high temperature to control the spread of fire and smoke. Other VXS subsystems continue to provide ventilation to the unaffected fire areas. This subsystem may be restarted and manually realigned to the once-through smoke exhaust ventilation mode to minimize the potential migration of smoke. If the exhaust fire-smoke damper for this fire area is operable, the damper may be reopened to further reduce the migration of smoke. After the fire, smoke is removed from this fire area by reopening the fire dampers and operating the ventilation system in the smoke exhaust ventilation mode.

Fire Protection Adequacy Evaluation

A fire in this fire area is detected by a fire detector which produces an audible alarm locally and both visual and audible alarms in the main control room and the security central alarm station. The fire is extinguished by the preaction sprinkler system or manually using hose streams or portable extinguishers.

Combustible materials in this fire area are listed in Table 9A-3, and primarily consist of cable insulation for cables associated with the electrical equipment and containment penetrations in this fire area. There are small concentrations of cable overhead, at the electrical penetrations, and at the electrical cabinets located along the east and west walls of room 12321. This is a light hazard fire area and the rate of fire growth is expected to be slow. Three-hour fire barriers provide adequate separation from adjacent fire areas and the fire is contained within the fire area. An automatic suppression system is provided to increase the availability of non-safety related systems required to achieve cold shutdown.

The ventilation system does not contribute to the spread of the fire or smoke as described in the Smoke Control Features section above.

Fire Protection System Integrity

An evaluation of the consequences of inadvertent operation of an automatic suppression system in this fire area is considered in the evaluation of internal flooding in Section 3.4.

Safe Shutdown Evaluation

Table 9A-2 lists the safe shutdown components located in this fire area. The electrical equipment in this area is non-Class 1E; however, some division B and D cables are routed through this area. In the event of a fire, the division B and D cabling in this area can be damaged. This damage can result in loss of control of equipment serviced by these cables. Other components in divisions B and D are not affected.

This fire can also disable the division B and D inputs to the reactor trip switchgear. The signals from the remaining two divisions are sufficient to trip the reactor. Furthermore, the reactor can be tripped with the diverse actuation system described in Section 7.7.

~~Spurious DAS actuation of squib valves is prevented by the use of a squib valve controller circuit which requires multiple hot shorts for actuation, physical separation of potential hot short locations, and provisions for operator action to remove power from the fire area. No postulated fire can spread to the hot short locations before the operator can remove power from the fire area.~~

~~Following detection of a fire in the non Class 1E equipment/penetration room, the operators can close the automatic depressurization system stage 4 block valves, then remove DAS actuation power. This~~

~~operator action will prevent spurious actuation of squib valves resulting from multiple hot shorts in the non-Class 1E equipment/penetration room.~~

Neither a fire nor fire suppression activities in this fire area affect the safe shutdown capability of components located in adjacent fire areas.

4.2.8 Section 9A.3.1.3.1.1

9A.3.1.3.1.1 Fire Area 1200 AF 01

This fire area includes most of the radiologically controlled areas of the auxiliary building outside the fuel handling area. This fire area contains one of the two normal residual heat removal pumps and the heat exchangers, the liquid radwaste system, spent fuel pool cooling system, radiologically controlled area ventilation system, chemical and volume control system makeup pump, containment isolation valve area, and lower annulus areas. The fire area is subdivided into the following fire zones:

Fire Zone	Room No.	
1200 AF 12241	12241	Lower annulus east
1200 AF 12241	12242	Lower annulus southeast
1200 AF 12461	12461	Corridor
1205 AF 12362	12362	Normal residual heat removal heat exchanger room
1205 AF 12365	12365	Waste monitor tank room B
1210 AF 12151	12151	Demineralizer/filter room
1210 AF 12151	12155	Gaseous radwaste system equipment room
1210 AF 12151	12156	Liquid radwaste system equipment room
1210 AF 12151	12158	Degasifier discharge pump room
1210 AF 12151	12258	Degasifier column
1210 AF 12171	12171	Effluent holdup tank room A
1214 AF 12152	12152	Primary sample room
1214 AF 12154	12154	Auxiliary building sump room
1214 AF 12154	12254	Spent fuel pool cooling system penetration room
1214 AF 12354	12354	Mid-annulus access room
1215 AF 12161	12161	Corridor
1215 AF 12162	12162	Normal residual heat removal pump room A
1216 AF 12166	12166	Waste holdup tank room A
1216 AF 12167	12167	Waste holdup tank room B
1216 AF 12169	12168	Corridor
1216 AF 12169	12169	Corridor
1216 AF 12169	12268	Liquid radwaste system pump room
1216 AF 12264	12264	Chemical waste tank room
1216 AF 12264	12265	Waste monitor tank room C
1216 AF 12172	12172	Effluent holdup tank room B
1220 AF 12251	12251	Demineralizer/filter access area
1220 AF 12251	12255	Chemical and volume control system makeup pump room

1220 AF 12259	12259	Pipe chase
1220 AF 12256	12256	Containment isolation valve area
1220 AF 12269	12269	Pipe chase
1220 AF 12256	12253	Pipe chase
1220 AF 12272	12272	Spent fuel pool cooling system pump room A
1220 AF 12272	12273	Spent fuel pool cooling system heat exchanger room A
1220 AF 12272	12274	Spent fuel pool cooling system pump room B
1220 AF 12272	12275	Spent fuel pool cooling system heat exchanger room B
1224 AF 12252	12252	Radiation chemistry laboratory
1225 AF 12261	12261	Corridor
1225 AF 12261	12271	Liquid radwaste system pump room
1225 AF 12262	12262	Piping/valve room
1234 AF 12351	12351	Maintenance floor staging area
1234 AF 12352	12352	Personnel hatch
1235 AF 12363	12363	Waste monitor tank room A
1244 AF 12451	12451	Security room
1244 AF 12452	12452	Containment air filtration system penetration room
1244 AF 12454	12454	Containment air filtration system/spent fuel pool cooling system/primary sampling system penetration room
1235 AF 12361	12361	Corridor
1250 AF 12561	12551	Access corridor
1250 AF 12561	12561	Component cooling water system valve room
1254 AF 12553	12553	Personnel access area
1254 AF 12554	12554	Security room
1264 AF 12651	12651	Radiologically controlled area ventilation system equipment room

The equipment and piping in this fire area normally contain radioactive material.

Fire Detection and Suppression Features

- Fire detectors
- Wet pipe sprinklers (Fire Zone 1220 AF 12251, room 12255)
- Hose station(s)
- Portable fire extinguishers

Smoke Control Features

The radiologically controlled area ventilation system (VAS) serves this fire area on a once-through basis. Some of the ventilation system equipment is also located within this fire area. For a fire that does not disable the ventilation system, the system continues to ventilate the fire area unless the operator decides to shut down the system, or until heat from the fire is sufficient to close the fire dampers. Fire dampers close automatically on high temperature to control the spread of fire and smoke. If the radiologically controlled area ventilation system is not affected by the fire, smoke is removed from the fire area by reopening the fire dampers after a fire and exhausting to the atmosphere. If the radiologically controlled area ventilation system is unavailable, smoke is removed from the fire area using portable exhaust fans and flexible ductwork.

Fire Protection Adequacy Evaluation

A fire in this fire area is detected by fire detectors which produces an audible alarm locally and both visual and audible alarms in the main control room and the security central alarm station. The fire is extinguished by the wet pipe sprinkler system or manually using hose streams or portable extinguishers.

Combustible materials in this large fire area are listed in Table 9A-3, and consist primarily of cable insulation for cables associated with the mechanical equipment and instrumentation in this fire area. There are small concentrations of lubricants in fire zones containing pumps and the radiologically controlled area ventilation system equipment. There are small concentrations of paper and plastic in some fire zones. Concentrations of paper or plastic anti-contamination clothing may also be present in some fire zones. There are small concentrations of cable in the overhead cable trays in many fire zones. This is a light hazard fire area and the rate of fire growth is expected to be slow. Three-hour fire barriers provide adequate separation from adjacent fire areas and the fire is contained within the fire area. An automatic suppression system is provided to increase the availability of non-safety related systems required to achieve cold shutdown.

The ventilation system does not contribute to the spread of the fire or smoke as described in the Smoke Control Features section above.

Fire Protection System Integrity

The consequences of inadvertent operation of an automatic suppression system in this fire area or of fire suppression systems that drains to this fire area from the radwaste building, or of a break in a fire protection line in this fire area, are considered in the evaluation of internal flooding in Section 3.4.

Safe Shutdown Evaluation

Table 9A-2 lists the safe shutdown components located in this fire area. The electrical equipment in this area is non-Class 1E; however, some division A and C cables are routed through this area. In the event of a fire, the division A and C cabling in this area can be damaged. This damage can result in loss of control of equipment serviced by these cables. Other components in divisions A and C are not affected.

The normal residual heat removal, primary sampling system, spent fuel pool cooling system and containment air filtration system containment isolation valves are conservatively assumed to be disabled as a result of a fire in this fire area. The redundant normal residual heat removal, primary sampling system, spent fuel pool cooling system and containment air filtration system containment isolation valves located inside containment are outside of this fire area and are sufficient to perform the applicable functions to maintain containment integrity and achieve and maintain safe shutdown. Cable trays supplying these valves and other components are not required for safe shutdown.

Spurious DAS actuation of squib valves is prevented by the use of a squib valve controller circuit which requires multiple hot shorts for actuation, physical separation of potential hot short locations, and provisions for operator action to remove power from the fire area. No postulated fire can spread to the hot short locations before the operator can remove power from the fire area.

Following detection of a fire in the non-Class 1E equipment/penetration room, the operators can close the automatic depressurization system stage 4 block valves, then remove DAS actuation power. This operator action will prevent spurious actuation of squib valves resulting from multiple hot shorts in the non-Class 1E equipment/penetration room.

Neither a fire nor fire suppression activities in this fire area affect the safe shutdown capability of components located in adjacent fire areas.

No fire in this fire area can cause spurious actions which could cause a breach in the reactor coolant boundary or defeat safety-related decay heat removal capability or cause an increase in shutdown reactivity of the reactor.

4.2.9 Table 9A-3

Revise the following entries in Table 9A-3 as follows:

Table 9A-3. Fire Protection Summary (Sheet 4 of 22)

Fire Area/ Zone(1)	Safety Area?(2)	Floor Area Sq Ft	Combust. Material(3)	Fire Sev. Cat.	Amount	Comb. Heat Value (Btu)	Load, Btu/ Sq Ft	Boundary Equiv. Dur. (Min)	Fire Res.(4) (Hours)	Detect. Cap.	Fixed Suppression Capability(5)
1244 AF 12451			CABLE INS	C	450	4.6E+06					
SECURITY ROOM			PAPER	C	500	3.9E+06					
		308	NET CAT.	C	TOTAL:	8.5E+06	27600	28			
~~1244 AF 12452~~			~~CABLE INS~~	~~C~~	~~500~~	~~5.1E+06~~					
~~VFS PENETRATION ROOM~~		~~265~~	~~NET CAT.~~	~~C~~	~~TOTAL:~~	~~5.1E+06~~	~~19000~~	~~14~~			
1244 AF 12452			CABLE INS	C	600	6.1E+06					
VFS PENETRATION ROOM		265	NET CAT.	C	TOTAL:	6.1E+06	23100	20			

4.2.10 Table 14.3-3

Revise Table 14.3-3 as follows:

Table 14.3-3. Anticipated Transient Without Scram

Reference	Design Feature	Value
Section 7.7.1.11	The diverse actuation system is a nonsafety-related system that provides a diverse backup to the protection and safety monitoring system.	
Section 7.7.1.11	The diverse actuation system trips the reactor control rods and the turbine on low wide range steam generator water level and on low pressurizer water level.	
Section 7.7.1.11	The diverse actuation system initiates passive residual heat removal on low wide range steam generator water level or high hot leg temperature; actuates core makeup tanks and trips the reactor coolant pumps on low pressurizer water level; and isolates selected containment penetrations and starts passive containment cooling on high containment temperature.	
Section 7.7.1.11	The manual actuation function of the diverse actuation system is implemented by wiring the controls located in the main control room directly to the final loads in a way that bypasses the normal path through the control room multiplexers, the protection and safety monitoring system cabinets, and the diverse actuation system logic.	
Section 7.7.1.11	The diverse actuation system uses a microprocessor or special purpose logic processor board different from those used in the protection and safety monitoring system.	
Section 7.7.1.11	The diverse actuation system hardware implementation is different from that of the protection and safety monitoring system.	
Section 7.7.1.11	The operating system and programming language of the diverse actuation system is different from that of the protection and safety monitoring system.	

4.2.11 Table 14.3-6

Revise Table 14.3-6 as follows:

Table 14.3-6. Probabilistic Risk Assessment (Sheet 7 of 10)

Reference	Design Feature	Value
Figure 7.2-1 (Sheets 16 and 20)	The squib valves and MOVs for reactor cavity flooding are manually actuated via PMS and DAS from the control room.	
Sections 7.3.1.2.7 7.7.1.11	The PRHR air-operated valves are automatically actuated and manually actuated from the control room by either PMS or DAS.	
Section 7.3.1.2.20	The RNS containment isolation MOVs are actuated via PMS.	
Section 7.5.4	PMS has two divisions of safety-related post-accident parameter display.	
Section 7.6.1.1	An interlock is provided for the normally closed motor-operated normal residual heat removal system inner and outer suction isolation valves. Each valve is interlocked so that it cannot be opened unless the reactor coolant system pressure is below a preset pressure.	
Section 7.7.1.11	The diverse actuation system is a nonsafety-related system that provides a diverse backup to the protection and safety monitoring system.	
Section 7.7.1.11	The diverse actuation system trips the reactor control rods and the turbine on low wide range steam generator water level and on low pressurizer water level.	
Section 7.7.1.11	DAS manual initiation functions are implemented in a manner that bypasses the signal processing equipment of the DAS.	
Section 7.7.1.11	The DAS automatic actuation signals are generated in a functionally diverse manner from the PMS signals. Diversity between DAS and PMS is achieved by the use of different architectures, ~~different~~ hardware implementations, and ~~different~~ any software.	
Section 8.3.1.1.1	On loss of power to a 6900V diesel-backed bus, the associated diesel generator automatically starts and produces ac power. The source circuit breakers and bus load circuit breakers are opened, and the generator is connected to the bus. Each generator has an automatic load sequencer to enable controlled loading on the associated buses.	

4.2.12 Table 17.4-1

Revise Table 17.4-1 as follows:

DCD Table 17.4-1. Risk-Significant SSCs Within the Scope of D-RAP (Sheet 1 of 8)

System, Structure, or Component (SSC)(1)	Rationale(2)	Insights and Assumptions
System: Component Cooling Water (CCS)		
Component Cooling Water Pumps (CCS-MP-01A/B)	EP	These pumps provide cooling of the normal residual heat removal system (RNS) and the spent fuel pool heat exchanger. Cooling the RNS heat exchanger is important to investment protection during shutdown reduced-inventory conditions. CCS valve realignment is not required for reduced-inventory conditions.
System: Containment System (CNS)		
Containment Vessel (CNS-MV-01)	EP, L2	The containment vessel provides a barrier to steam and radioactivity released to the atmosphere following accidents.
Hydrogen Igniters (VLS-EH-1 through -64)	EP, L2, Regulations	The hydrogen igniters provide a means to control H2 concentration in the containment atmosphere, consistent with the hydrogen control requirements of 10 CFR 50.34f.
System: Chemical and Volume Control System (CVS)		
Makeup Pumps (CVS-MP-01A/B)	RAW/CCF	These pumps provide makeup to the RCS to accommodate leaks and to provide negative reactivity for shutdowns, steam line breaks, and ATWS.
Makeup Pump Suction and Discharge Check Valves (CVS-PL-V113, -V160A/B)	RAW	These CVS check valves are normally closed and have to open to allow makeup pump operation.
System: Diverse Actuation System (DAS)		
DAS Processor Cabinets and Control Panel (used to provide automatic and manual actuation) (DAS-JD-001, -002, -004 OCS-JC-020)	RAW	The DAS is diverse from the PMS and provides automatic and manual actuation of selected plant features including control rod insertion, turbine trip, passive residual heat removal (PRHR) heat exchanger actuation, core makeup tank actuation, isolation of critical containment lines, and passive containment cooling system (PCS) actuation.
Annex Building UPS Distribution Panels (EDS1-EA-1, EDS1-EA-14, EDS2-EA-1, EDS2-EA-14)	RAW	These panels distribute power to the DAS equipment.
Rod Drive MG Sets (Field Breakers) (PLS-MG-01A/B)	RAW	These breakers open on a DAS reactor trip signal demand to de-energize the control rod MG sets and allow the rods to drop.

4.2.13 Table 19.59-18

Revise Table 19.59-18 as follows:

Table 19.59-18. AP1000 PRA-Based Insights (Sheet 8 of 24)

Insight	Disposition
2. (cont.)	
– A verification and validation program prepared to confirm the design implemented will function as required (IEEE standard, Section 5.3.4, "Verification and Validation")	
– Equipment qualification testing performed to demonstrate that the system will function as required in the environment it is intended to be installed in (IEEE standard, Section 5.4, "Equipment Qualification")	
– Design for system integrity (performing its intended safety function) when subjected to all conditions, external or internal, that have significant potential for defeating the safety function (abnormal conditions and events) (IEEE standard, Section 5.5, "System Integrity")	
– Software configuration management process (IEEE standard, Section 5.3.5, "Software Configuration Management").	
3. The diverse actuation system (DAS) provides a nonsafety-related means of performing the following functions:	Tier 1 Information
– Initiates automatic and manual reactor trip	
– Automatic and manual actuation of selected engineered safety features.	
Diversity is assumed in the PRA that eliminates the potential for common cause failures between PMS and DAS.	
– The DAS automatic actuation signals are generated in a diverse manner from the PMS signals. The DAS automatic actuation signals are generated in a functionally diverse manner from the PMS signals. Diversity between DAS and PMS is achieved by the use of different architectures, ~~different~~ hardware implementations, and ~~different~~ any software.	Tier 1 Information
DAS provides control room displays and fixed position controls to allow the operators to take manual actions.	7.7.1
DAS actuates using 2-out-of-2 logic. Actuation signals are output to the loads in the form of normally de-energized, energize-to-actuate signals. The normally de-energized output state, along with the dual 2-out-of-2 redundancy, reduces the probability of inadvertent actuation.	7.7.1.11
The actuation devices of DAS and PMS are capable of independent operation that is not affected by the operation of the other. The DAS is designed to actuate components only in a manner that initiates the safety function.	7.7.1.11
The DAS reactor trip function is to trip the control rods by deenergizing the motor-generator set.	7.7.1.11

(Last Page of Section 4)