US-APWR DCD Tier 1 Enhancement Project

Wednesday 2/16/11

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US-APWR DCD Tier 1 Enhancement Effort

The Tier 1 enhancement effort is being performed by a team of MHI/MNES, Luminant, and Dominion personnel. The effort was initiated in June 2010 with the objective of improving the overall quality of Tier 1 and in particular, the inspectability of ITAAC. The proposed Tier 1 changes will facilitate the NRC's review and approval of the DCD and the completion, inspection, and closure of ITAAC. The changes will minimize potential impacts on construction and operations.

The team's Tier 1 review criteria were based on NRC guidance (e.g., SRP 14.3 and RIS 2008-05, Revision 1), recent industry experience from other Design Centers, and engineering judgment. The review resulted in the addition and deletion of ITAAC, the revision of Design Description information to provide an appropriate level of content in a standard format directly incorporating the ITAAC Design Commitments, and various other changes that improve ITAAC clarity and inspectability.

A redline/strikeout version of each Tier 1 section was prepared to identify the proposed changes. A "Basis" document was also prepared for each section, which provides an explanation, or basis for the proposed changes. The Basis documents identify RAI responses altered by the proposed Tier 1 changes. The review team used a consistent methodology in the preparation of the redline/strikeout and Basis documents, including standardized explanations for certain changes.

The redline/strikeout version for each Tier 1 section includes alpha-numeric right margin annotations (RMAs) for the proposed Design Description changes (see Figure 1). Proposed ITAAC changes are referenced by the ITAAC table row number (see Figure 2). An explanation of the changes represented by each RMA or ITAAC table row number is provided in the Basis document by the corresponding item or row numbers (see Figure 3).

Note that these are enhancements and contain no design changes.

Figure 1: Example Design Description Markup

2.5.4 Information Systems Important to Safety

2.5.4.1 Design Description

The PSMS and PCMS provide plant operators with the information systems important to safety for: (1) assessing plant conditions and safety system performance, and making decisions related to plant responses to abnormal events; and (2) preplanned manual operator actions related to accident mitigation. The information systems important to safety also provide the necessary information from which appropriate actions can be taken to mitigate the consequences of the AOOs.

The information important to safety includes the following:

- Post accident monitoring (PAM)
- Bypassed and inoperable status indication (BISI)
- Plant annunciators (alarms)
- Safety parameter displays system (SPDS)
- Information and control for credited manual operator actions

~~The necessary information important to safety is available for the display at the following facilities:~~

- ~~Main control room (MCR)~~
- ~~Remote shutdown room (RSR)~~
- ~~Technical support center (TSC)~~
- ~~Emergency operations facility (EOF)~~

~~Controls for credited manual operator actions are available in the MCR.~~

~~Figure 2.5.4-1 shows the configuration of the PSMS and PCMS for implementation of the information systems important to safety. The PSMS redundancy, independence, testability, qualification, quality and life cycle descriptions of Subsection 2.5.1 are also applicable to the information systems important to safety within the PSMS. The PCMS redundancy, qualification and quality descriptions applicable to the information systems important to safety are as described in Subsection 2.5.5.~~

The PAM variables are identified in Table 2.5.4-1, and the alarms for the credited manual actions are identified in Table 2.5.4-3.

1. PAM variables as identified in Table 2.5.4-1, BISI, SPDS information, and plant alarms for credited manual actions as identified in Table 2.5.4-3, for information systems important to safety, are provided on safety and non-safety HSI equipment at the MCR, RSR, TSC, and EOF, as shown in Figure 2.5.4-1.

2. Deleted.

RMA

A

B

C

D

E

F

G

Figure 2: Example ITAAC Table Markup

Table 2.5.4-2 Information Systems Important to Safety Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. PAM variables as identified in Table 2.5.4-1, BISI, SPDS information, and plant alarms for credited manual actions as identified in Table 2.5.4-3, for information systems important to safety, are provided on safety and non-safety HSI equipment at the MCR, RSR, TSC, and EOF, as shown in Figure 2.5.4-1.~~Information systems important to safety (PAM, BISI, alarms, SPDS) are appropriately displayed and alarmed in the MCR, RSR, TSC and EOF, as appropriate.~~	1. An inspection ~~A test~~ will be performed of the MCR, RSR, TSC and EOF facilities ~~to demonstrate alarm, display and control capabilities~~ for retrievability of alarms and displays for information systems important to safety.	1. Displays for PAM variables identified in Table 2.5.4-1, BISI, SPDS, and plant alarms for credited manual actions as identified in Table 2.5.4-3, for information systems important to safety, can be retrieved on non-safety HSI equipment~~The as-built information systems important to safety (PAM, BISI, alarms, SPDS) are appropriately displayed and alarmed~~ in the as-built MCR, RSR, TSC and EOF, ~~as appropriate~~ as shown in Figure 2.5.4-1. Displays for PAM variables as identified in Table 2.5.4-1 and alarms for credited manual actions as identified in Table 2.5.4-3, for information systems important to safety, can be retrieved on safety HSI equipment in the as-built MCR and RSR, as shown in Figure 2.5.4-1.
2. Deleted.~~Information and controls for credited manual operator actions are provided in the MCR.~~	2. Deleted.~~A test of the as-built PSMS and PCMS will be performed.~~	2. Deleted.~~The information and controls for credited manual operator actions are provided in the as-built MCR.~~
3. The field instrumentation for the PAM variables identified in Table 2.5.4-1 ~~as being~~ that is ~~qualified for~~subjected to a harsh environment ~~is designed to~~ can withstand the environmental conditions that would exist before, during, and following a design basis ~~event~~ accident without loss of safety function for the time required to perform the safety function.	3.i Type tests, ~~and/or analyses,~~ or a combination of type tests and analyses using the design environmental conditions, or under conditions which bound the design environmental conditions, will be performed on the field instrumentation for the PAM variables identified in Table 2.5.4-1~~located in a~~ that is subjected to a harsh environment.	3.i A report exists and ~~The results of the type tests, and/or analyses~~concludes that the field instrumentation for the PAM variables identified in Table 2.5.4-1 ~~as being~~ that is subjected to ~~qualified for~~ a harsh environment can withstand the environmental conditions that would exist before, during, and following a design basis accident~~event~~ without loss of safety function for the time required to perform the safety function.

Figure 3: Example Basis Document

Alpha RMA Number Items

Design Description Change Explanation

ITAAC # and Change Explanation

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.5.4

Item No.	Explanation/Basis for Change
Design Description Section 2.5.4.1	
A	Notes 1 and 2. See Item F.
B	Information deleted; redundant to Figure 2.5.4-1 note, and controls for credited manual operator actions are the subject of other Tier 1 sections, Section 2.5.4 is about information systems.
C	Notes 1 and 2 (first sentence of paragraph). See Item F.
D	Text revised (second and third sentences deleted) to include only the necessary attributes for Tier 1 Design Description introductory information.
E	Added reference to new table.
F	Notes 1 and 2. See Items A and C.
G	Note 1.
H	Note 1.
I	Note 1.
Table 2.5.4-1	
	No changes
ITAAC Table 2.5.4-2	
1	DC – Revised for clarification and to be more specific in the commitment scope description. [RIS - Standardization, 2nd bullet; Scope 1st bullet.] ITA – Inspection is the correct ITA for verification of the existence of alarms and displays; and ITA revised for generic changes to ITAAC wording for MCR alarms and displays to provide clarity and consistency. [RIS - Focus, sixth bullet; Scope 2nd bullet.] AC – Revised for clarification and for consistency with DC and ITA, and revised for generic changes to ITAAC for MCR alarms and displays wording to provide clarity and consistency. [RIS – Nomenclature, 7th bullet; Standardization, 2nd bullet; Scope, 1st bullet]
2	DC, ITA, AC – Deleted ITAAC as the verification of information displays is redundant to ITAAC #1, and the controls for credited manual operator actions are verified by other appropriate Tier 1 (systems) ITAAC. This change alters the response to RAI 488, 14.03.11-40.
3	DC, ITA, AC – Generic changes to ITAAC for environmental qualification to provide clarity and consistency. [RIS - Standardization, 2nd bullet; p.7, Scope, 2nd bullet] These changes do not impact the response to RAI 181, 14.03.05-06 or RAI 191, 14.03.04-03. These changes alter the responses to RAI 511, Revision 0, 03.11-21 and 03.11-24.

Draft Rev B 1

Note 1: Revised to provide consistency between the Design Description (DD) and the Design Commitment (DC) in the ITAAC table. Revised text to include only the necessary attributes for ITAAC.

Note 2: Text relocated within the DD section to align with the sequence and numbering of the corresponding DC in the ITAAC table.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 1.0 - Introduction

Item No.	Explanation/Basis for Change
A	Descriptive information has been deleted because this information is not needed in Tier 1. This information is included in Tier 2, Sections 1.2 and 14.3. First sentence of Section 1.2 is relocated to Section 1.2.5.
B	Editorial changes.
C	Editorial changes.
D	Definition reworded for clarity per response to RAI Q01-7.
E	New definition added for completeness.
F	Editorial changes.
G	Definitions of divisions reworded for clarity.
H	Editorial changes.
I	Definition reworded to clarify the scope of inspections.
J	New definition added for completeness.
K	Definition reworded to clarify the scope of the definition for “operate.”
L	Editorial changes.
M	New definition added for completeness.
N	New definition added for completeness.
O	Editorial change to correct section reference.
P	Editorial changes.
Q	The definitions of Tier 1 and Tier 2 have been deleted because this information is not needed in Tier 1.
R	Descriptive information has been deleted because this information is not needed in Tier 1. This information is included in Tier 2, Section 14.3.
S	The wording under “Treatment of Individual Items,” has been revised to adopt wording that the NRC and industry have previously found acceptable.
T	The wording under “ITAAC Tables,” has been revised to adopt wording for the Design Commitment, ITA, and Acceptance Criteria that the NRC and industry have previously found acceptable.
U	The “Examples of ITAAC” have been deleted because this information is not needed in Tier 1. This information is included in Tier 2, Section 14.3.
V	The wording in Section 1.4.5 has been relocated to new Section 1.2.2. This alters the response to RAI 511, RAI 03.11-28.
W	Original wording deleted and new wording added under Section 1.2.3, “Discussion of Matters Related to Operations,” for clarity.
X	New Section 1.2.4, “Interpretation of Figures,” added for clarity using wording that the NRC and industry have previously found acceptable. Existing wording deleted.
Y	New Section 1.2.5, “Rated Reactor Core Thermal Power,” added.
Z	Wording revised for clarity.
AA	Editorial changes.
AB	Editorial changes as shown. The line shape on the 2nd “Component Name” box under “Miscellaneous” has been changed for clarity. Also, the sample figure below the “ASME Code Break” has been changed to a more typical example.
AC	Editorial change to first paragraph. New wording added to end of section to clarify that tag numbers used in Tier 1 are not part of the certified design; tag numbers may be different in the final plant design.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 1.0 - Introduction

Item No.	Explanation/Basis for Change
AD	Typical site arrangement deleted because this figure is not needed in Tier 1. This information is included in Tier 2, Figure 1.2-1.
AE	Editorial change and replaced with the example of ASME Code Class Break for clarity.
AF	Valve symbols of gate valve, butterfly valve, glove valve and metal diaphragm valve are simplified into one symbol as two-way valve.
AG	Air intake and outlet symbols added for clarity.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.1

Item No.	Explanation/Basis for Change
Design Description 2.1	
A	Clarify the intent of the sentence.
Table 2.1-1	
B	Text revised as described in DCD Rev.2 RAI Tracking Report Revision 3, MUAP-09026 (R3).
C	Text revised to acknowledge that in addition to tornadoes, hurricanes may result in extreme wind speeds that need to be accounted for in design of safety-related SSCs. ASCE 7-05, *Minimum Design Loads for Buildings and Other Structures*, Section C6.5.5 and Table C6-3, specifies that the importance factor in hurricane-prone areas must be determined using a value of the square root of 1.6 multiplied by the basic wind speed. Thus, the importance factor for hurricane-prone zones is 1.26 rather than 1.15.
D	The site parameters "Subsurface stability – shear wave velocity for defining firm rock," defining firm to hard rock, and defining hard rock were removed because these are definitions and are not site parameters which can be compared to site characteristic values.
E	Text revised as described in response to DCD RAI 496, Question 03.08.05-32.
F	Editorial correction.
Figures 2.1-1 and 2.1-2	
	No change

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.7.1.3

Item No.	Explanation/Basis for Change
Design Description and ITAAC Table 2.7.1.3	
A	Design Description text and ITAAC table deleted. The main condenser does not meet the ITAAC/Tier 1 selection criteria described in DCD Tier 2, Section 14.3 and NRC guidance in SRP Section 14.3 and RG 1.206, Section C.II.1.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.7.1.4

Item No.	Explanation/Basis for Change
Design Description and ITAAC Table 2.7.1.4	
A	Design Description text and ITAAC table deleted. The Main Condenser Evacuation System does not meet the ITAAC/Tier 1 selection criteria described in DCD Tier 2, Section 14.3 and NRC guidance in SRP Section 14.3 and RG 1.206, Section C.II.1. The MCES radiation monitors (RMS-RE-043A,B and RMS-RE-081A,B) are addressed as part of the Process Effluent Radiation Monitoring and Sampling System (PERMS) in Tier 1 Section 2.7.6.6, Table 2.7.6.6-1.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.7.1.5

Item No.	Explanation/Basis for Change
Design Description and ITAAC Table 2.7.1.5	
A	Design Description text and ITAAC table deleted. The Gland Seal System (GSS) does not meet the ITAAC/Tier 1 selection criteria described in DCD Tier 2, Section 14.3 and NRC guidance in SRP Section 14.3 and RG 1.206, Section C.II.1. The GSS radiation monitors (RMS-RE-044A,B and RMS-RE-082A,B) are addressed as part of the Process Effluent Radiation Monitoring and Sampling System (PERMS) in Tier 1 Section 2.7.6.6, Table 2.7.6.6-1.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.7.1.6

Item No.	Explanation/Basis for Change
Design Description 2.7.1.6.1	
A	Text added and revised to provide a more complete description of the functional arrangement.
B	Wording revised and relocated to introductory paragraph for consistency within Tier 1. See Items D and E.
C	Note 1.
D	Wording relocated to introductory paragraph for consistency within Tier 1. See Item B.
E	Wording revised and relocated to introductory paragraph for consistency within Tier 1. See Item B.
F	Negative statements deleted from Design Description for consistency within Tier 1.
ITAAC Table 2.7.1.6-1	
1	DC, ITA, and AC Generic changes to ITAAC for functional arrangement to provide clarity and consistency. [RIS p7, ITAAC Scope, 2nd bullet]

Note 1: Revised to provide consistency between the Design Description (DD) and the Design Commitment (DC) in the ITAAC table. Revised text to include only the necessary attributes for ITAAC.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.7.1.7

Item No.	Explanation/Basis for Change
Design Description 2.7.1.7 and ITAAC Table 2.7.1.7-1	
A	Design Description text and ITAAC table deleted. The Circulating Water System does not meet the ITAAC/Tier 1 selection criteria described in DCD Tier 2, Section 14.3 and the NRC guidance in SRP Section 14.3 and RG 1.206, Section C.II.1.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.7.1.8

Item No.	Explanation/Basis for Change
Design Description 2.7.1.8 and ITAAC Table 2.7.1.8-1	
A	Design Description text and ITAAC table deleted. The Condensate Polishing System does not meet the ITAAC/Tier 1 selection criteria described in DCD Tier 2, Section 14.3 and the NRC guidance in SRP Section 14.3 and RG 1.206, Section C.II.1.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.7.1.12

Item No.	Explanation/Basis for Change
Design Description 2.7.1.12 and ITAAC Table 2.7.1.12-1	
A	Design Description text and ITAAC table deleted. The Secondary Side Chemical Injection System does not meet the ITAAC/Tier 1 selection criteria described in DCD Tier 2, Section 14.3 and the NRC guidance in SRP Section 14.3 and RG 1.206, Section C.II.1. This change impacts the response to RAI 184, question 14.03.07-28.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.7.1.13

Item No.	Explanation/Basis for Change
Design Description and ITAAC Table 2.7.1.13	
A	Design Description text and ITAAC table deleted. The Auxiliary Steam Supply System does not meet the ITAAC/Tier 1 selection criteria described in DCD Tier 2, Section 14.3 and NRC guidance in SRP Section 14.3 and RG 1.206, Section C.II.1. The ASSS radiation monitor (RMS-RE-057) is addressed as part of the Process Effluent Radiation Monitoring and Sampling System (PERMS) in Tier 1 Section 2.7.6.6, Table 2.7.6.6-1.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.7.3.2

Item No.	Explanation/Basis for Change
Design Description 2.7.3.2.1 and ITAAC Table 2.7.3.2-1	
A	Design Description text and ITAAC table deleted. The Non- Essential Service Water System does not meet the ITAAC/Tier 1 selection criteria described in DCD Tier 2, Section 14.3 and NRC guidance in SRP Section 14.3 and RG 1.206, Section C.II.1.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.7.3.4

Item No.	Explanation/Basis for Change
Design Description 2.7.3.4.1 and ITAAC Table 2.7.3.4-1	
A	Design Description text and ITAAC table deleted. The Turbine Component Cooling Water System does not meet the ITAAC/Tier 1 selection criteria described in DCD Tier 2, Section 14.3 and NRC guidance in SRP Section 14.3 and RG 1.206, Section C.II.1.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.7.5.5

Item No.	Explanation/Basis for Change
Design Description and ITAAC Table 2.7.5.5-1	
A	Design Description text and ITAAC table deleted. The Turbine Building Area Ventilation System does not meet the ITAAC/Tier 1 selection criteria described in DCD Tier 2, Section 14.3 nor the NRC guidance in SRP Section 14.3 and RG 1.206, Section C.II.1. This change does not impact the response to RAI 054, question 14.03.07-4. This change alters the response to RAI 184, question 14.03.07-25. This change does not impact the response to RAI 355, question 09.04.03-5.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.7.6.11

Item No.	Explanation/Basis for Change
Design Description and ITAAC Table 2.7.6.11	
A	Design Description text and ITAAC table deleted. The Condensate Storage Facilities do not meet the ITAAC/Tier 1 selection criteria described in DCD Tier 2, Section 14.3 and NRC guidance in SRP Section 14.3 and RG 1.206, Section C.II.1.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.7.6.12

Item No.	Explanation/Basis for Change
Design Description and ITAAC Table 2.7.6.12	
A	Design Description text and ITAAC table deleted. The Potable and Sanitary Water system does not meet the ITAAC/Tier 1 selection criteria described in DCD Tier 2, Section 14.3 and NRC guidance in SRP Section 14.3 and RG 1.206, Section C.II.1.
B	Deleting these sections, affects the wording of Enclosure 1 of UAP-HF-10046 which is based on CP COL RAI #126, Question 09.02.04-1.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.8

Item No.	Explanation/Basis for Change
Design Description 2.8.1	
A	Notes 1 and 2. See item E. A portion of this statement is addressed in Section 2.2, Table 2.2-4, Item 1.
A1	Revised to eliminate redundant text. See first paragraph of Section 2.8.1.
B	Notes 1 and 2. See item E. A portion of this statement is addressed in Section 2.2, Table 2.2-4, Item 1.
C	Notes 1 and 2. See item G.
C1	Revised to reference redundant information and ITAAC in Section 2.2. See ITAAC Table 2.8-1, Item 1.a.
D	See ITAAC No. 1.a.
E	Notes 1 and 2. See items A and B.
F	See ITAAC No. 2.
G	Notes 1 and 2. See item C.
H	Revised to eliminate redundant text. See item E. This change alters RAI 183, 14.03.07-14.
ITAAC Table 2.8-1	
1.a	DC, ITA, AC – Deleted redundant reference ITAAC that is addressed in Section 2.2, Table 2.2-4, Item 1. This change alters the response to RAI 508, 14.03.07-50
1.b	DC – Revised to more clearly state the intent of the Design Commitment. [RIS 2008-05, page 7, 4th bullet] ITA – Revised to more specifically state the scope of the inspections and to make terminology more consistent with AC. AC – Revised based on response to RAI 508, 14.03.07-50 and to restate the DC.
2	DC, ITA, AC – Deleted redundant reference ITAAC that is addressed in Section 2.7.6.13. The DD also refers to Section 2.7.6.13. This change alters the proposed mark-up provided in UAP-HF-10043, RAI 183, 14.03.07-13, and RAI 447, 14.3-1.
3	DC – Revised to more clearly state the intent of the Design Commitment. [RIS 2008-05, page 7, 4th bullet] ITA – Revised to create a two-part ITA that reflects the need for both, analysis and testing. [RIS 2008-05, page 5, 2nd bullet] AC – Revised to create a two-part AC that comports with the ITA. [RIS 2008-05, page 5, 2nd bullet]
Table 2.8-2	
	No changes

Note 1: Revised to provide consistency between the Design Description (DD) and the Design Commitment (DC) in the ITAAC table. Revised text to include only the necessary attributes for ITAAC.

Note 2: Text relocated within the DD section to align with the sequence and numbering of the corresponding DC in the ITAAC table.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.10

Item No.	Explanation/Basis for Change
Design Description 2.10	
A	Notes 1 and 2. See item H.
B	Reworded to make editorial clarification.
C	Revised to exclude the location information of the EOF. This is site-specific information.
D	Revised to replace redundant information with references to the associated Tier 1 sections. See items E, F, and G.
E	This information is redundant because necessary attributes are addressed in Tier 1 Section 2.7.6.10. See item D.
F	This information is redundant because necessary attributes are addressed in Tier 1 Section 2.7.6.10. See item D.
G	This information is redundant because necessary attributes are addressed in Tier 1 Section 2.5.4. See item D.
H	Notes 1 and 2. See item A.
I	Note 1.
ITAAC Table 2.10-1	
1	DC – Change made to delete explanatory and supplemental information to include necessary attributes in ITAAC. ITA – Analysis added because it is necessary to determine the floor space. [RIS p5, Logic, seventh bullet] AC – Change made to reference a report where "analysis" is specified in the ITA. [RIS p5, Logic, seventh bullet]
2	AC – Criteria are replaced for clarity. Change alters the responses to RAI 195, 14.03.10-1. [RIS p4, Nomenclature, seventh bullet, and RIS p5, Logic, seventh bullet]
3	DC, ITA, AC – Change made to delete redundant ITAAC (referenced ITAAC). Change alters the responses to RAI 195, 14.03.10-2.
4	DC, ITA, AC – Change made to delete redundant ITAAC (referenced ITAAC). Change alters the responses to RAI 195, 14.03.10-2 and proposed mark-up provided in UAP-HF-10043.

Note 1: Revised to provide consistency between the Design Description (DD) and the Design Commitment (DC) in the ITAAC table. Revised text to include only the necessary attributes for ITAAC.

Note 2: Text relocated within the DD section to align with the sequence and numbering of the corresponding DC in the ITAAC table.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.12

Item No.	Explanation/Basis for Change
Design Description 2.12	
A	Reworded to make consistent with revised design description text.
B	Revised to make consistent with corresponding DC.
C	Revised to make consistent with corresponding DC.
D	Revised to make consistent with corresponding DC.
E	Revised to make consistent with corresponding DC.
F	Revised to make consistent with corresponding DC.
G	Revised to make consistent with corresponding DC.
H	See ITAAC Table 2.12-1, item #14.
I	Revised to make consistent with corresponding DC.
J	Text was relocated to 16.b.i.
K	Revised to make consistent with corresponding DC.
L	See ITAAC Table 2.12-1, item #16.c.
ITAAC Table 2.12-1	
1	1.a: DC – Change made to delete redundant text. Change does not impact the response to RAI 282, 13.6-21 and RAI 396, 14.03.12-19. 1.b: No changes
2	2.a: No changes 2.b: No changes 2.c: No changes
3	3.a: No changes 3.b: No changes 3.c: DC, ITA, AC – Change made to be consistent with the numbering of SRP 14.3.12. Change does not impact the response to RAI 282, 13.6-21 and RAI 396, 14.03.12-19. [SRP 14.3.12 p14.3.12A-3, PS-ITAAC#3(c)]
4	4.a: No changes 4.b: No changes 4.c: No changes
5	No changes
6	6.a: No changes 6.b: No changes
7	No changes
8	8.a: No changes 8.b: No changes
9	No changes
10	10.a: No changes 10.b: No changes

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.12

Item No.	Explanation/Basis for Change
11	11.a.i: No changes 11.a.ii: No changes 11.b.i: No changes 11.b.ii: No changes 11.c: No changes 11.d: No changes 11.e: DC, ITA, AC – Change made to be consistent with the numbering of SRP 14.3.12. Change does not impact the response to RAI 282, 13.6-21 and RAI 396, 14.03.12-19. [SRP 14.3.12 p14.3.12A-13, PS-ITAAC#11(e)]
12	No changes
13	13.a: No changes 13.b.i: No changes 13.b.ii: No changes
14	DC, AC – The term "disposition" is deleted to make consistent with template in SRP 14.3.12 Revision 1. Change alters the response to RAI 282, 13.6-21 and RAI 396, 14.03.12-19. [SRP 14.3.12 p14.3.12A-16, PS-ITAAC#14] – Change made to reword to be consistent with the wording in SRP 14.3.12. Change alters the response to RAI 282, 13.6-21 and RAI 396, 14.03.12-19. [SRP 14.3.12 p14.3.12A-16, PS-ITAAC#14]
15	15.a: No changes 15.b: No changes
16	16.a.i: AC – Change made to reword to be consistent with the wording in SRP 14.3.12. Change alters the response to RAI 282, 13.6-21 and RAI 396, 14.03.12-19. [SRP 14.3.12 p14.3.12A-18, PS-ITAAC#16(a)] 16.a.ii: No changes 16.b.i: AC – Change made to reword to be consistent with the wording in SRP 14.3.12 Revision 1. Change alters the response to RAI 282, 13.6-21 and RAI 396, 14.03.12-19. [SRP 14.3.12 p14.3.12A-18, PS-ITAAC#16(b)] 16.b.ii: No changes 16.c.i: DC, ITA, AC – Change made to add ITAAC for nonportable communications equipment in the central alarm station to be consistent with the wording in SRP 14.3.12. Change alters the response to RAI 282, 13.6-21 and RAI 396, 14.03.12-19. [SRP 14.3.12 p14.3.12A-18, PS-ITAAC#16(c)] 16.c.ii: DC, ITA, AC – Change made to be consistent with the numbering of SRP 14.3.12. Change alters the response to RAI 282, 13.6-21 and RAI 396, 14.03.12-19. [SRP 14.3.12 p14.3.12A-18, PS-ITAAC#16(c)]

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.13

Item No.	Explanation/Basis for Change
Design Description 2.13	
A	Grammatical corrections
B	Reworded to provide clarity
C	Revised to be consistent with corresponding DC.
ITAAC Table 2.13-1	
1	AC Change made to provide clarity. Change does not impact the response to RAI 175, 17.04-37.

Tier 1 Changes Explanation/Basis Document
Tier 1, Section 2.14

Item No.	Explanation/Basis for Change
2.14.1 Design Description	
A	Added text for consistency with industry practice for the ITP commitment.
B	Editorial
C	Deleted the sentence regarding qualified personnel because the first sentence states that the ITP manual controls the qualification of ITP participants.
D	Added "copies" of reports in order to ensure that it is not misinterpreted that the actual approved original test procedures are to be made available. Note also consistent with other technologies.
E	Discussion of construction tests deleted because the ITP, per SRP 14.2, and RG 1.68 is not required to include these tests and therefore details are not required.
F	The text describing the sequence of test phases has been deleted to ensure that it is not misinterpreted that one could not begin preoperational testing unless the construction testing phase was complete. In actuality, preoperational testing could begin on one system while another system was still in the construction testing phase.
G	Added logic and interlock testing to be included in the description of preoperational testing for consistency Tier 2 Chapter 14.
H	Per SRP 14.2, preoperational testing and not startup testing is performed to demonstrate meeting design criteria. Therefore, "design criteria" will be removed from the startup testing purpose description for consistency with SRP 14.2.
I	Delete "(less than 5% power)" as this level of detail will be finalized during the test procedure development stage. Some of the tests are performed at the power level greater than 5% to obtain appropriate test conditions. Replacing "test" with "testing" is editorial.
J	Deleted the sentence regarding the successful completion of ITAAC because it does not appear relevant to the ITP, especially since there are no ITAAC for the ITP.
2.14.2 Inspections, Tests, Analyses, and Acceptance Criteria	
	No changes to this section.

1.0 INTRODUCTION

~~This chapter identifies the purpose and scope of this Tier 1 document; defines various terms used; identifies general provisions associated with design descriptions and inspections, tests, analyses, and acceptance criteria (ITAAC); and provides a legend for symbols used in the Tier 1 figures.~~

~~1.1 PURPOSE~~

~~The purpose of this document is to provide information on the design of the US-APWR to support approval and certification of this standard nuclear power plant by the U.S. Nuclear Regulatory Commission (NRC) under the provisions of 10 Code of Federal Regulations (CFR) Part 52.~~

~~1.2 SCOPE~~

~~The US-APWR is an advanced light-water reactor plant with reactor thermal power of 4451 MWt designed by Mitsubishi Heavy Industries, Ltd. (MHI). Figure 1-1 shows a typical US-APWR plant site.~~

~~The main power block of the US-APWR standard design is comprised of the following buildings and structures:~~

A

- ~~The reactor building (R/B), including the prestressed concrete containment vessel (PCCV) and the containment internal structure~~
- ~~The power source buildings (PS/Bs)~~
- ~~The power source fuel storage vaults (PSFSVs)~~
- ~~The essential service water pipe tunnel (ESWPT)~~
- ~~The auxiliary building (A/B)~~
- ~~The turbine building (T/B)~~
- ~~The access building (AC/B)~~

~~Although the system descriptions of the PSFSVs and ESWPT are within the scope of the US-APWR standard design, the structural design of the PSFSVs and ESWPT, including seismic and dynamic qualification as applicable, are to be finalized based on the site-specific arrangement.~~

~~The information in this document comprises the design information related to the US-APWR standard nuclear power plant that is to be certified by the NRC. This technical information is commonly referred to as the certified design material or Tier 1 material.~~

~~The US-APWR Design Control Document (DCD) is divided into two parts.~~

~~The Tier 1 document provides top-level information on the plant design, including the principal performance characteristics and safety functions of the structures, systems, and components (SSCs). It provides ITAAC to be used to provide reasonable assurance that the as-built plant will operate in conformity with the Combined License (COL), the provisions of the Atomic Energy Act, and applicable NRC regulations. It also identifies significant site parameters and requirements for significant interfaces between the US-APWR standard design and those portions of site specific.~~

~~The separate Tier 2 document provides more-detailed information on the plant design. This information is to be approved but not certified by NRC. Information contained in the Tier 1 document was derived from the Tier 2 document.~~

~~The Tier 1 document is organized into three chapters, with this chapter providing introductory information.~~

~~Chapter 2 identifies site parameters and provides design descriptions and associated ITAAC for different aspects of the US-APWR standard design. The content of the design descriptions and the tables that provide ITAAC are discussed further in Section 1.4.~~

~~Chapter 3 addresses interface requirements focused on the safety design attributes and performance characteristics that ensure that the site-specific portion of the design is in conformance with the certified design. The site-specific portions of the design are those portions of the design that are dependent on characteristics of the site, such as the design of the ultimate heat sink. This chapter also identifies the scope of the design to be certified by specifying the systems that are completely or partially out of scope of the certified design.~~

~~In each chapter section or subsection, tables follow the text and figures follow the tables. The tables and figures are identified by numbers associated with the section or subsection in which they appear. For example, Figure 2.4.1-1 is the first figure in Subsection 2.4.1. Pages are numbered sequentially and identified by both the section number and the page number within that section.~~

~~The Tier 1 document addresses all major plant systems and structures, including systems not important to safety, in order to completely define the US-APWR design. However, descriptions of site-specific systems provide less technical information than those of safety-significant systems, and some site-specific systems are described only by their name. Relevant Unresolved Safety Issues (USIs), Generic Safety Issues (GSIs), Three Mile Island (TMI) items and operating experience are considered in the US-APWR design and reflected in the Tier 2 document upon which this Tier 1 document is based.~~

~~The Tier 1 document contains no proprietary information.~~

~~1.3~~1.1 DEFINITIONS

The following definitions apply to terms that may be used in the Design Descriptions and associated Inspections, Tests, Analyses, and Acceptance Criteria (ITAAC).~~are used in the design descriptions and the related ITAAC to ensure precision and consistency.~~ B

Acceptance C~~c~~riteria means~~refer to~~ the performance, physical condition, or analysis result for a structure, system, or component~~an SSC,~~ that~~to~~ demonstrates that the D~~d~~esign ~~requirement/~~C~~c~~ommitment is met. C

Analysis means a calculation, mathematical computation, or engineering/ technical evaluation. Engineering or technical evaluations could include, but are not limited to, comparisons with operating experience or design of similar SSCs.

As-built means the physical properties of a structure, system, or component~~the SSC~~ following ~~the~~ completion of its installation or construction activities at its final location at the plant site. In cases where it is technically justifiable, ~~D~~determination of physical properties of the as-built structure, system, or component may be based on measurements, inspections, or tests that occur prior to installation, provided that subsequent fabrication, handling, installation, and testing do not alter the properties. D

ASME Code means Section III of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code.

ASME Code Report means a report required by the ASME Code and whose content requirements are stipulated by the ASME Code. Each such ASME Code Report is final, and, when required, is certified in accordance with the Code. E

Column line is the designation applied to a plant reference grid used to define the locations of building walls and columns. Column lines may not represent the centerline of walls and columns.

Containment, when this term is used as "the containment," means the containment vessel or, as it is sometimes referred to, the prestressed concrete containment vessel.

Design C~~c~~ommitment means that portion of the D~~d~~esign D~~d~~escription that is verified by ITAAC. F

Design D~~d~~escription means that portion of the design that is certified.

Design plant grade means the elevation of the soil around the nuclear island assumed in the design (i.e., "plant grade" or "finished grade level") in relation to plant structures to which other plant elevations are correlated and which is set at 2'-7".

Division (for electrical systems~~ or equipment~~) is the designation applied to each portion of a given safety-related system (i.e.,~~or~~ the set of connected electrical components) that is ~~(are)~~ physically, electrically, and functionally independent from other redundant sets of components.

Division (for mechanical systems~~ or equipment~~) is the designation applied to a specific set of safety-related components that perform redundant, identical mechanical functions within a system. G

Exists, when this term is used in the A~~a~~cceptance C~~c~~riteria, means that the item is present and consistent with the D~~d~~esign D~~d~~escription.

Functional arrangement (for a system) means the physical arrangement of ~~systems and~~ components in a system to provide the function for which the system is intended as described in the ~~ITAAC~~ D~~d~~esign D~~d~~escription ~~and shown in the specified figures~~.

Harsh environment means the limiting environmental conditions resulting from a design basis accident.

Inspect or **Inspection** means visual observations, physical examinations, or reviews of records based on visual observation or physical examination that compare the SSC condition to one or more D~~d~~esign C~~c~~ommitments. Examples include, but are not limited to, walkdowns, configuration checks, measurements of dimensions, and~~or~~ nondestructive examinations. Inspections may also include review of design and construction documents including drawings, calculations, analyses, test procedures and results, certificates of compliance, purchase records, and other documents that verify that the Acceptance Criteria of a particular ITAAC are met.

Inspect for retrievability of a display or alarm means to visually observe that the specified information appears on a monitor when summoned by the operator.

Operate means the actuation, control, ~~and~~ running, or shutting down (e.g., closing, turning off) of the equipment.

Physical or **functional arrangement (for a structure)** means the arrangement of the building features (e.g., floors, ceilings, walls, doorways, and basemat) ~~and of the SSCs within the building,~~ as described in the ~~ITAAC~~ D~~d~~esign D~~d~~escription ~~and as shown in the figures~~.

PSMS Control means a safety-related control signal to a component or equipment from the protection and safety monitoring system. The signals may include automatic and remote-manual signals.

Qualified for a harsh environment means that the subject equipment can withstand environmental conditions that would exist before, during, and after a design basis accident and still perform its safety function.

Raceway system consists of the raceway (cable conduits and cable trays) and raceway supports including anchorages.

Report means, as used in the Acceptance Criteria, a document created by or for the licensee that verifies that the Acceptance Criteria of the subject ITAAC have been met and references the supporting documentation. Reports typically include, but are not limited to: results of walkdowns, results of visual inspections, field measurements, calculations, analyses, certificates of compliance, test results, or design and construction documents.

Tag number means the identifying number assigned to individual hardware items. Tag numbers in Tier 1 provide unique identification of the items and include system designation. ~~Tag numbers used elsewhere, e.g., Tier 2, may include additional~~

~~information.~~ Refer to Section 1.4~~1.6~~ for additional explanation of the Tier 1 numbering methodology.

Test or **Testing** means actuation or operation, or establishment of specified conditions to evaluate the performance or integrity of as-built SSCs, unless explicitly stated otherwise~~, to determine whether an ITAAC acceptance criterion is met~~. P

~~**Tier 1** means the portion of the design-related information contained in the DCD that is approved and certified by NRC in the design certification rule, commonly referred to as Tier 1 information or Tier 1 material.~~

~~**Tier 2** means the portion of the design-related information contained in the DCD that is approved but not certified by NRC (Tier 2 information). Compliance with Tier 2 is required, but generic changes to and plant-specific departures from Tier 2 are governed by the change process in the design certification rule. Compliance with Tier 2 provides a sufficient method for complying with Tier 1, but not the only acceptable method.~~ Q

Transfer open (or transfer closed) means to move from a closed position to an open position (or vice versa).

Type test means a test performed on one or more sample components to qualify other components of the same type and manufacturer. A type test is not necessarily a test of the as-built SSC.

~~1.4~~1.2 GENERAL PROVISIONS

The following general provisions are applicable to the Design Descriptions and associated ITAAC.~~information is provided to help place information contained in Chapter 2 and Chapter 3 into context.~~

~~1.4.1 Design Descriptions~~

~~A design description is simply a written narrative briefly describing a certain aspect of the US-APWR design. The narrative is typically supplemented by tables and figures.~~

~~The design descriptions address the most safety-significant aspects of each of the systems of the design, describing the top-level design features and performance characteristics most significant to safety. The amount of design information provided is proportional to the safety significance of the structure or system.~~

~~The applicable requirements from regulations, codes, and standards are stated in the design descriptions. However, these are not cited or referenced except in certain cases involving reference to various parts of Section III of the ASME Code.~~ R

~~Design descriptions also address matters not directly associated with specific systems, such as structural and systems engineering and the general design features of piping systems and components. The tables and figures identify the components, equipment, system piping, building walls, etc. that must be verified by ITAAC.~~

~~1.4.2~~1.2.1 Treatment of Individual Items

~~The design descriptions describe the US-APWR in sufficient detail to support NRC certification of the standard design. However, they are not necessarily all encompassing.~~

The absence of any discussion or depiction of an item in the Design Description or accompanying figures shall not be construed as prohibiting a licensee from utilizing such an item, unless it would prevent an item from performing its safety function(s), or impair the performance of those safety functions, as described or depicted in the Design Description or accompanying tables or figures.~~The licensee is not prohibited from using an item not described in Tier 1. Such an item would not have to be discussed in the design descriptions or shown in the accompanying tables or figures unless its use would prevent an item addressed in the design description from performing its described safety function.~~

S

If an inspection, test, or analysis requirement does not specify the temperature or other conditions under which the inspection, test or analysis must be conducted, then the conditions for the inspection, test or analysis are~~is~~ not constrained.

When the term "operate," "operates," or "operation" is used with respect to an item described in the Acceptance Criteria, it refers to the actuation, control, running, or shutting down of the item. When the term "exist," "exists," or "existence" is used with respect to an item described in the Acceptance Criteria, it means the item is present and meets the Design Commitment.~~As noted in the definition, the term "operates" or "operation" as utilized in Tier1 is intended to refer to the actuation and running of equipment. It is not meant to include the term "operable" in the context of the ongoing reliability and availability of equipment.~~

~~1.4.3~~1.2.2 ITAAC Tables

The ITAAC tables are arranged with three columns, with all ITAAC numbered for control purposes. The column headings are as follows:

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria

Each Design Commitment in the left-hand column of the ITAAC tables has an associated requirement for Inspections, Tests, or Analyses (ITA) specified in the middle column of the tables. The identification of a separate ITA entry for each Design Commitment shall not be construed to require that separate inspections, tests, or analyses must be performed for each Design Commitment. Instead, the activities associated with more than one ITA entry may be combined, and a single inspection, test, or analysis may be sufficient to implement more than one ITA entry.~~The first column of the ITAAC table identifies the proposed design requirement and/or commitment to be verified. This column generally contains the specific text of the design commitment,~~

T

~~which is extracted from the design description. In cases where a specific design commitment is summarized, the statement in the first column retains the principal performance characteristics and safety functions of the design feature to be verified.~~

An ITA may be performed by the licensee of the plant or by its authorized vendors, contractors, or consultants. Furthermore, an ITA may be performed by more than a single individual or group, may be implemented through discrete activities separated by time, and may be performed at any time prior to fuel load (including before issuance of the Combined License for those ITAAC that do not require as-built equipment). Additionally, ITA may be performed as part of the activities that are required to be performed under 10 CFR 50 (including, for example, the Quality Assurance (QA) program required under Appendix B to Part 50). Therefore, an ITA need not be performed as a separate or discrete activity.~~The second column of the ITAAC table identifies the proposed method – inspection, testing, analysis, or some combination of the three – by which the licensee will verify the design requirement/commitment described in the first column. If specified parameters are not provided in this column, there are no restrictions on the test condition.~~

W

Each ITA has an associated Acceptance Criteria in the third column that, if met, demonstrates that the licensee has met the Design Commitment in the first column. For each of the Acceptance Criteria, appropriate documentation may be a single document or a collection of documents that show that the stated Acceptance Criteria are met. Examples of appropriate documentation include design reports, test reports, inspection reports, analysis reports, evaluation reports, design and manufacturing procedures and records, certified data sheets, commercial dedication procedures and records, quality assurance records, calculation notes, and equipment qualification data packages.

The Acceptance Criteria are generally stated in terms of a value with an acceptable range, or with a value that is either a minimum or maximum. For these ITAAC, the acceptance criteria for performing the ITAAC will be as stated in the Acceptance Criteria. In some cases, the Acceptance Criteria are stated in terms of nominal values without an acceptable range. For these ITAAC, the acceptable range will be determined at the time of performing the ITAAC.

~~The third column of the ITAAC table identifies the proposed specific acceptance criteria for the inspections, tests, and/or analyses described in the second column that, if met, demonstrate that the licensee has met the design requirements/commitments in the first column.~~

~~The ITAAC are tailored to the specific subject matter or type of system as discussed in Subsection 1.4.4. While site parameters are addressed in Chapter 2, no ITAAC is provided for site parameters. Instead key site design parameters associated with the US-APWR standard design are identified and their values specified. An actual site for construction of a US-APWR plant is acceptable if its characteristics fall within the specified design parameter values.~~

~~The acceptance criteria are designed to be objective and unambiguous to prevent misinterpretation. When numeric performance values for SSCs are specified, these values are those assumed in the safety analyses, rather than the design values.~~

~~In some cases, an ITAAC statement in one section may refer to ITAAC in another Tier 1 section to avoid duplication. In these cases, completion of the ITAAC action will satisfy the requirements of both sections.~~

~~1.4.4 Examples of ITAAC~~

~~The focus of ITAAC varies with subject matter. For example:~~

- ~~ITAAC for structural and systems engineering focus on building structures and the structural aspects of major components, such as the reactor vessel, the pressurizer, and the steam generators.~~
- ~~The ITAAC for piping systems and components address the design, along with dynamic qualification, welding, fasteners, and safety classification of SSCs.~~
- ~~ITAAC for instrumentation and control equipment address compliance with NRC regulations and applicable Institute of Electrical and Electronics Engineers (IEEE) guidance as they pertain to safety systems.~~
- ~~ITAAC for the human factors interface system address the minimum inventory of alarms, controls, and indications appropriate for the main control room and the remote shutdown console.~~

U

~~Typical ITAAC address matters such as system functional arrangement, pressure boundary integrity, welding, seismic qualification, environmental qualification, and motor-operated valves. The approach taken on each of these matters is as follows:~~

- ~~The design commitment on functional arrangement generally indicates that the functional arrangement of a system is as shown in the system figure. The appropriate inspection, test, or analysis is typically an inspection of the as-built system. The acceptance criterion is typically that the system conforms to the functional arrangement shown in the figure.~~
- ~~The design commitment on pressure boundary integrity typically states that the ASME Code components of the system retain their pressure boundary integrity under internal pressures that are experienced during service. The appropriate inspection, test, and analysis is typically stated as follows: a hydrostatic test will be conducted on those components of the system required to be hydrostatically tested by the ASME Code, and preoperational non-destructive examination will be conducted on those components of the system for which inspections are required by the ASME Code. The acceptance criterion is typically that the results of the hydrostatic test of the ASME Code components of the system conform to the requirements in Section III of the ASME Code.~~

- ~~The design commitment on welding typically states that pressure boundary welds associated with the ASME Code components of the system meet the requirements of Section III of the ASME Code. The appropriate inspection, test, and analysis are usually non-destructive tests of the as-built pressure boundary welds as specified in Section III of the ASME Code. The acceptance criteria indicate that the ASME Code Section III requirements are met for non-destructive examination of the as-built pressure boundary welds.~~
- ~~The design commitment on seismic qualification typically states that the specified seismic Category I components can withstand design basis seismic loads and continue to serve their safety function. Type tests and/or analyses of the seismic Category I components are specified to verify the design commitment. The acceptance criteria typically indicate that the results of the type tests and/or analyses concludes that the seismic Category I equipment can withstand seismic design basis loads without loss of safety function.~~
- ~~The design commitment on environmental qualification typically indicates that the specified components can maintain functional operability under all service conditions, including design basis accidents. The appropriate inspection, test, and analysis typically involve inspections of the components and the associated wiring, cabling, and terminations located in a harsh environment, along with type tests and/or analyses. The acceptance criteria indicates that the results of the type tests, and/or analyses conclude that the Class 1E equipment as being qualified for a harsh environment can withstand the environmental conditions.~~
- ~~The design commitment on motor-operated valves typically states that the specified valves open, close, or both open and close under differential pressure, fluid flow, and temperature conditions. The appropriate inspection, test, or analysis typically involves tests of the installed valves under system preoperational conditions. The acceptance criteria typically entail the appropriate operation upon receipt of the actuating signal.~~

~~1.4.5 Implementation of Inspections, Tests, and Analyses~~

~~Although ITAAC are identified separately for each design commitment, this practice does not mean that a separate inspection, test, or analysis is required for each design commitment. A single inspection, test, or analysis may suffice for verification of multiple design commitments.~~ V

~~The licensee is responsible for performance of the specified inspections, tests, and analyses. However, this effort may be accomplished by authorized vendors, contractors, or consultants, and not only by the licensee organization.~~

~~The specified inspections, tests, and analyses must be completed before fuel load. However, they do not have to be performed as part of a separate ITAAC program. For example, certain inspections, tests, and analyses could be performed as part of quality assurance activities performed in accordance with 10 CFR Part 50, Appendix B.~~

1.2.3 Discussion of Matters Related to Operations

In some cases, the Design Descriptions in this document refer to matters that relate to operation, such as normal valve or breaker alignment during normal operation modes. Such discussions are provided solely to place the Design Description provisions in context (e.g., to explain automatic features for opening or closing valves or breakers upon off-normal conditions). Such descriptions shall not be construed as requiring operators during operation to take any particular action (e.g., to maintain valves or breakers in a particular position during normal operation). ~~In those cases where a design description mentions operations – such a noting a particular valve position in a certain operational mode – this information is provided only to help establish context for the design descriptions. In no way do any such discussions imply that operators should take a particular action under the given circumstances.~~ W

1.2.4 Interpretation of Figures

In many but not all cases, the Design Descriptions in Section 2 include one or more figures, which may represent a functional diagram, general structural representation, or another general illustration. Unless specified explicitly, these figures are not indicative of the scale, location, dimensions, shape, or spatial relationships of as-built SSCs. In particular, the as-built attributes of SSCs may vary from the attributes depicted on these figures, provided that those safety functions described in the Design Description pertaining to the figure are not adversely affected.

~~1.5 FIGURES AND FIGURE LEGEND~~ X

~~The figures provided in support of design descriptions are simplified schematic drawings. They provide the following information, as applicable:~~

- ~~The figures depict the functional arrangement of the significant SSCs of the standard design.~~
- ~~The amount of information depicted is based on the safety significance of the SSCs, with figures for non safety-related systems having less detail than figures for safety-related systems.~~
- ~~The figures show components discussed in the design description.~~
- ~~The figures clearly delineate system boundaries with other systems.~~

~~These figures are generalized schematic illustrations of SSCs. Unless otherwise specified, they are not to scale and are not intended to represent characteristics such as location or spatial relationships.~~

1.2.5 Rated Reactor Core Thermal Power

The rated reactor core thermal power for the US-APWR certified design is 4451 megawatts thermal (MWt). Y

1.3 Figure Legend

Certain Tier 1 sections include figures in the Design Description. The symbols used on the figures are identified on the following pages. The figure legend is provided for information only and is not part of the Tier 1 Material.

Z

MECHANICAL EQUIPMENT

SYMBOL DESCRIPTION

CENTRIFUGAL PUMP

TANK

CENTRIFUGAL FAN

AXIAL FAN

HEAT EXCHANGER (SHELL & TUBE TYPE)

HEAT EXCHANGER (PLATE TYPE)

ECC/CS STRAINER

STEAM TURBINE

DRIVEN PUMP

ESSENTIAL SERVICE WATER PUMP

HEPA — HIGH EFFICIENCY PARTI~~E~~CULATE AIR (HEPA) FILTER — AA

C — CHARCOAL ADSORBER

HE/F — HIGH EFFICIENCY FILTER — AA

C/C — CHILLED WATER COOLING COIL

EH/C — ELECT~~E~~RIC HEATING COIL — AA

CAPPED STUB END

BLIND FLANGE

ORIFICE

AIR INTAKE

AIR OUTLET

AG

VALVE

SYMBOL DESCRIPTION

- CHECK VALVE
- ~~GATE~~TWO-WAY VALVE
- ~~BUTTERFLY VALVE~~
- ~~GLOVE VALVE~~
- ~~METAL DIAPHRAGM VALVE~~
- PRESSURE RELIEF VALVE
- THREE-WAY VALVE

VALVE OPERATORS

SYMBOL DESCRIPTION

- MOTOR OPERATOR
- SOLENOID OPERATOR
- SYTEM MEDIUM OPERATOR
- AIR OPERATOR
- AIR OPERATOR WITH POSITIONER

DAMPERS

SYMBOL DESCRIPTION

- ELECTRO HYDRAULIC OPERATED DAMPER
- MOTOR OPERATED DAMPER
- AIR OPERATED DAMPER

ELECTRICAL EQUIPMENT

SYMBOL DESCRIPTION

- HIGH VOLTAGE CIRCUIT BREAKER
- DRAWOUT TYPE CIRCUIT BREAKER
- MOLDED CASE CIRCUIT BREAKER
- DISCONNECTING SWITCH
- LOAD BREAK SWITCH
- LINKS
- TRANSFORMER
- GENERATOR
- WIRING
- CONTACTOR
- DIODE
- RECTIFIER
- --- M --- MECHANICAL INTERLOCK
- --- K --- MECHANICAL KEY INTERLOCK
- AC/DC CONVERTER
- INVERTER
- BATTERY

AF

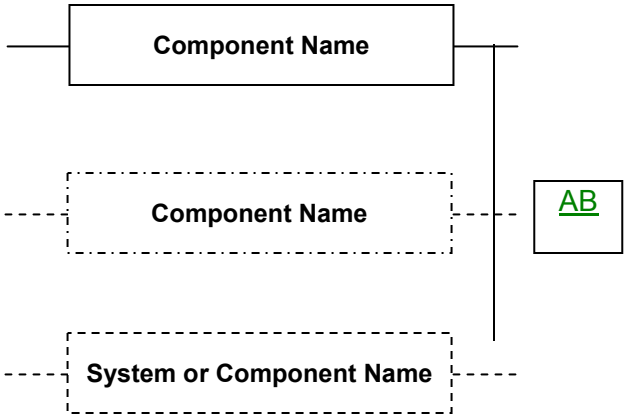
TORNADO DAMPER

MISCELLANEOUS

A component that is part of the system functional arrangement shown on the figure and is i~~I~~ncluded in the D~~d~~esign C~~c~~ommitments for the system.

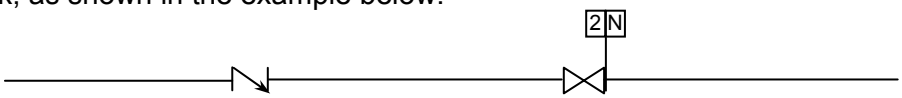
A component that is part of the system functional arrangement shown on the figure.

A system or component of another system that is not part of the system functional arrangement shown on the figure.



ASME CODE CLASS BREAK

An ASME Code class break is identified by a single line to the designated location for the class break, as shown in the example below.



AE

1.~~6~~4 Tag N~~n~~umbers

Tag numbers are used in Tier 1 to uniquely identify hardware items in the US-APWR. An example of the Tier 1 tag number format is shown below for the steam generator in Division A ~~is shown below~~:

RCS – MHX – 001A

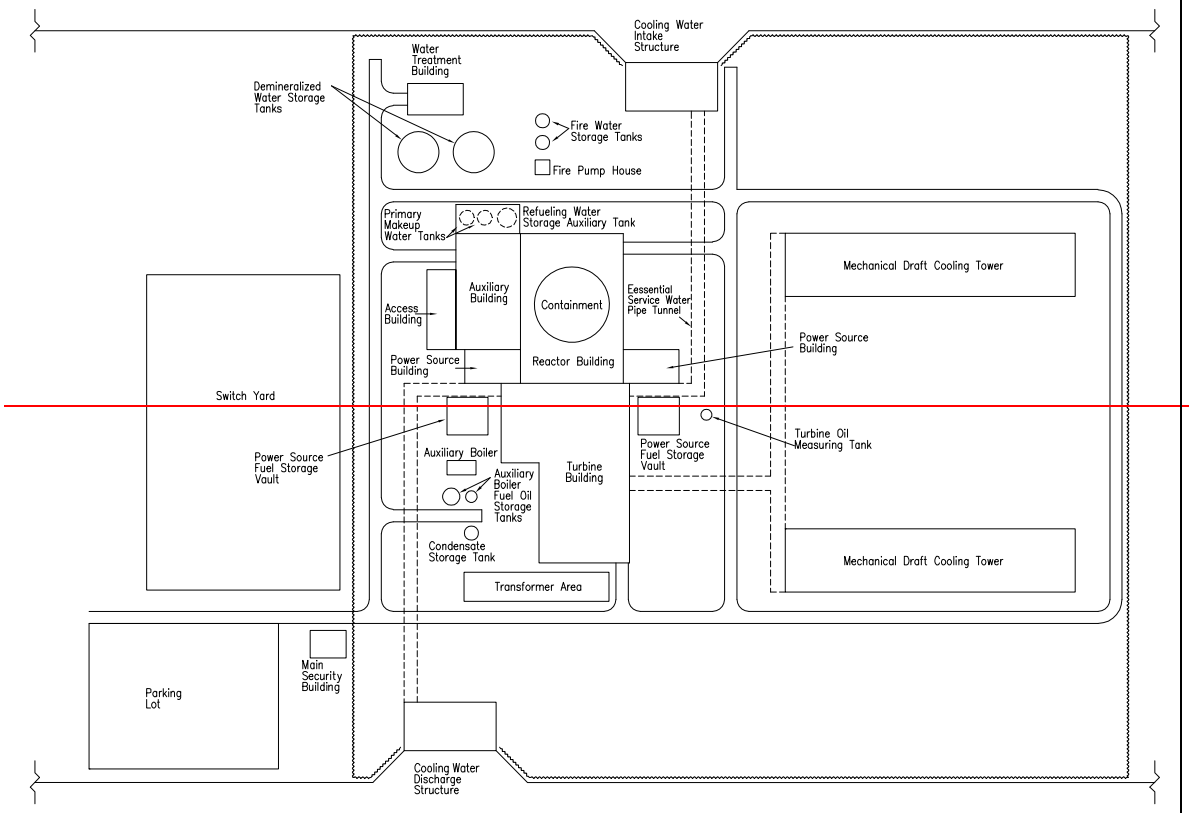
AC

Where:

RCS is the System Code for reactor coolant system
MHX is the Equipment Function Code for heat exchanger
001 is the Serial Number
A is the suffix for Division A

The Tier 1 tag number format conforms to the full equipment number from which the plant designator and safety designator are omitted.

Tier 1 tag numbers are not part of the Tier 1 material.



AD

~~Figure 1-1 US-APWR Plant Typical Site Arrangement~~

2.1 SITE PARAMETERS

This section identifies key site parameters postulated for the US-APWR standard plant design. These parameters apply to the design of safety-related aspects of SSCs of the US-APWR.

2.1.1 Design Description

The design descriptions applicable to this section are reflected in the specified key site parameters identified in Table 2.1-1. ~~-~~A~~n actual~~ site for construction of a US-APWR plant will be acceptable if ~~its~~the site-specific characteristics fall within the ~~design~~key site parameter values specified in Table 2.1-1. In case of deviation from these parameters, justification may be provided that the proposed facility is acceptable at the proposed site. A

2.1.2 Inspections, Tests, Analyses, and Acceptance Criteria

This section does not provide ITAAC.

Table 2.1-1 Key Site Parameters
(Sheet 1 of 7)

Meteorology	
Parameter Description	**Parameter Value**
Normal winter precipitation roof load[11]	50 lb/ft^2
Extreme winter precipitation roof load[12] ~~(100-year snowpack maximum snow weight including contributing portion of either extreme frozen winter precipitation event or extreme liquid winter precipitation event)~~	75 lb/ft^2
48-hr probable maximum winter precipitation~~[13]~~ (PMWP)	36 in.
Tornado maximum wind speed	230 mph
	184 mph maximum rotational
	46 mph maximum translational
Radius of maximum rotational speed	150 ft
Tornado maximum pressure drop	1.2 psi
Rate of pressure drop	0.5 psi/s
Tornado-generated missile spectrum and associated velocities	15 ft long schedule 40 steel pipe moving horizontally at 135 ft/s[1]
	4,000 lb automobile moving horizontally at 135 ft/s[1]
	1 in diameter steel sphere moving horizontally at 26 ft/s[1]
Extreme wind speed (other than ~~in~~for a tornado or hurricane prone area)	155 mph for 3-second gusts at 33 ft above ground level based on 100-year return period, with importance factor of 1.15 for seismic category I/II structures
~~Ambient design air temperature (5% exceedance maximum)~~ ~~Secondary HVAC~~	~~95°F dry bulb, 77°F coincident wet bulb, 79°F non-coincident wet bulb~~
~~Normal Plant Heat Sink~~	~~92°F dry bulb, 75°F coincident wet bulb, 76°F non-coincident wet bulb~~
Ambient design air temperature (1% annual exceedance maximum)	100°F dry bulb, 77°F coincident wet bulb, 81°F non-coincident wet bulb
Ambient design air temperature (0% annual exceedance maximum)	115°F dry bulb, 80°F coincident wet bulb, 86°F non-coincident wet bulb, historical limit excluding peaks <2 hr
~~Ambient design air temperature (5% exceedance minimum)~~	~~-5°F dry bulb~~
Ambient design air temperature (1% annual exceedance minimum)	-10°F dry bulb
Ambient design air temperature (0% annual exceedance minimum)	-40°F dry bulb, historical limit excluding peaks <2 hr

B B C B B

Table 2.1-1 Key Site Parameters
(Sheet 2 of 7)

Parameter Description	Parameter Value
Atmospheric dispersion factors (χ/Q values) for onsite locations:	
Exclusion area boundary (EAB) 0-2 hrs	5.0×10^{-4} s/m^3
EAB annual average	1.6×10^{-5} s/m^3
Atmospheric dispersion factors (χ/Q values) for offsite locations:	
Low-population zone (LPZ) boundary 0-8 hrs 8-24 hrs 1-4 days 4-30 days	 2.1×10^{-4} s/m^3 1.3×10^{-4} s/m^3 6.9×10^{-5} s/m^3 2.8×10^{-5} s/m^3
Food production area annual average	5.0×10^{-6} s/m^3
Deposition factor (D/Q value) for onsite and offsite locations:	
EAB annual average	4.0×10^{-8} 1/m^2

Table 2.1-1 Key Site Parameters
(Sheet 3 of 7)

Atmospheric dispersion factors (χ/Q values) for main control room (MCR) heating, ventilation, and air conditioning (HVAC) intake for specified release points[2]:	
Plant vent [5]	
0-8 hrs	1.1×10^{-3} s/m^3
8-24 hrs	6.6×10^{-4} s/m^3
1-4 days	4.2×10^{-4} s/m^3
4-30 days	2.8~~1.9~~$\times10^{-4}$ s/m^3
Ground-level containment releases[4]	
0-8 hrs	2.2×10^{-3} s/m^3
8-24 hrs	1.3×10^{-3} s/m^3
1-4 days	8.3×10^{-4} s/m^3
4-30 days	5.5~~3.6~~$\times10^{-4}$ s/m^3
Main steam relief valve and safety valve releases[6]	
0-8 hrs	5.3×10^{-3} s/m^3
8-24 hrs	3.1×10^{-3} s/m^3
1-4 days	2.0×10^{-3} s/m^3
4-30 days	~~8.7×10^{-4}~~ 1.3×10^{-3} s/m^3
Steam line break releases [8]	
0-8 hrs	1.9×10^{-2} s/m^3
8-24 hrs	1.1×10^{-2} s/m^3
1-4 days	7.1×10^{-3} s/m^3
4-30 days	4.7~~3.1~~$\times10^{-3}$ s/m^3
Fuel handling area releases [7]	
0-8 hrs	1.1×10^{-3} s/m^3
8-24 hrs	6.4×10^{-4} s/m^3
1-4 days	4.1×10^{-4} s/m^3
4-30 days	2.7~~1.8~~$\times10^{-4}$ s/m^3

B

Table 2.1-1 Key Site Parameters
(Sheet 4 of 7)

Atmospheric dispersion factors (χ/Q values) for MCR inleak for specified release points[3]*:*	
Plant vent [9]	
0-8 hrs	1.3×10^{-3} s/m^3
8-24 hrs	7.8×10^{-4} s/m^3
1-4 days	4.9×10^{-4} s/m^3
4-30 days	3.3~~2.2~~$\times10^{-4}$ s/m^3
Plant vent [10]	
0-8 hrs	1.4×10^{-3} s/m^3
8-24 hrs	8.0×10^{-4} s/m^3
1-4 days	5.1×10^{-4} s/m^3
4-30 days	3.3~~2.2~~$\times10^{-4}$ s/m^3
Ground-level containment releases ~~to Class 1E electrical room HVAC intake~~ [4]	
0-8 hrs	2.4×10^{-3} s/m^3
8-24 hrs	1.4×10^{-3} s/m^3
1-4 days	9.1×10^{-4} s/m^3
4-30 days	6.0~~4.0~~$\times10^{-4}$ s/m^3
Main steam relief valve and safety valve releases [6]	
0-8 hrs	5.3×10^{-3} s/m^3
8-24 hrs	3.1×10^{-3} s/m^3
1-4 days	2.0×10^{-3} s/m^3
4-30 days	~~8.7×10^{-4}~~ 1.3×10^{-3} s/m^3
Steam line break releases [8]	
0-8 hrs	1.9×10^{-2} s/m^3
8-24 hrs	1.1×10^{-2} s/m^3
1-4 days	7.1×10^{-3} s/m^3
4-30 days	4.7~~3.1~~$\times10^{-3}$ s/m^3
Fuel handling area releases [7]	
0-8 hrs	1.1×10^{-3} s/m^3
8-24 hrs	6.7×10^{-4} s/m^3
1-4 days	4.3×10^{-4} s/m^3
4-30 days	2.8~~1.9~~$\times10^{-4}$ s/m^3

B

Table 2.1-1 Key Site Parameters
(Sheet 5 of 7)

Atmospheric dispersion factors (χ/Q values) for Technical Support Center (TSC) HVAC intake for specified release points[2]:	
Plant vent [5]	
0-8 hrs	1.4×10^{-3} s/m^3
8-24 hrs	8.0×10^{-4} s/m^3
1-4 days	5.1×10^{-4} s/m^3
4-30 days	3.3~~2.2~~$\times10^{-4}$ s/m^3
Ground-level containment releases[4]	
0-8 hrs	1.9×10^{-3} s/m^3
8-24 hrs	1.1×10^{-3} s/m^3
1-4 days	7.2×10^{-4} s/m^3
4-30 days	4.8~~3.2~~$\times10^{-4}$ s/m^3
Main steam relief valve and safety valve releases[6]	
0-8 hrs	1.7×10^{-3} s/m^3
8-24 hrs	9.9×10^{-4} s/m^3
1-4 days	6.3×10^{-4} s/m^3
4-30 days	4.2~~2.8~~$\times10^{-4}$ s/m^3
Steam line break releases [8]	
0-8 hrs	1.4×10^{-3} s/m^3
8-24 hrs	8.4×10^{-4} s/m^3
1-4 days	5.3×10^{-4} s/m^3
4-30 days	3.5~~2.3~~$\times10^{-4}$ s/m^3
Fuel handling area releases [7]	
0-8 hrs	6.7×10^{-4} s/m^3
8-24 hrs	3.9×10^{-4} s/m^3
1-4 days	2.5×10^{-4} s/m^3
4-30 days	1.7~~1.1~~$\times10^{-4}$ s/m^3

B

Table 2.1-1 Key Site Parameters
(Sheet 6 of 7)

Atmospheric dispersion factors (χ/Q values) for TSC inleakage for specified release points[3]*:*	
Plant vent [5]	
0-8 hrs	1.4×10^{-3} s/m^3
8-24 hrs	8.0×10^{-4} s/m^3
1-4 days	5.1×10^{-4} s/m^3
4-30 days	3.3~~2.2~~$\times10^{-4}$ s/m^3
Ground-level containment releases [4]	
0-8 hrs	1.9×10^{-3} s/m^3
8-24 hrs	1.1×10^{-3} s/m^3
1-4 days	7.2×10^{-4} s/m^3
4-30 days	4.8~~3.2~~$\times10^{-4}$ s/m^3
Main steam relief valve and safety valve releases [6]	
0-8 hrs	1.7×10^{-3} s/m^3
8-24 hrs	9.9×10^{-4} s/m^3
1-4 days	6.3×10^{-4} s/m^3
4-30 days	4.2~~2.8~~$\times10^{-4}$ s/m^3
Steam line break releases [8]	
0-8 hrs	1.4×10^{-3} s/m^3
8-24 hrs	8.4×10^{-4} s/m^3
1-4 days	5.3×10^{-4} s/m^3
4-30 days	3.5~~2.3~~$\times10^{-4}$ s/m^3
Fuel handling area releases [7]	
0-8 hrs	6.7×10^{-4} s/m^3
8-24 hrs	3.9×10^{-4} s/m^3
1-4 days	2.5×10^{-4} s/m^3
4-30 days	1.7~~1.1~~$\times10^{-4}$ s/m^3

B

Table 2.1-1 Key Site Parameters
(Sheet 7 of 7)

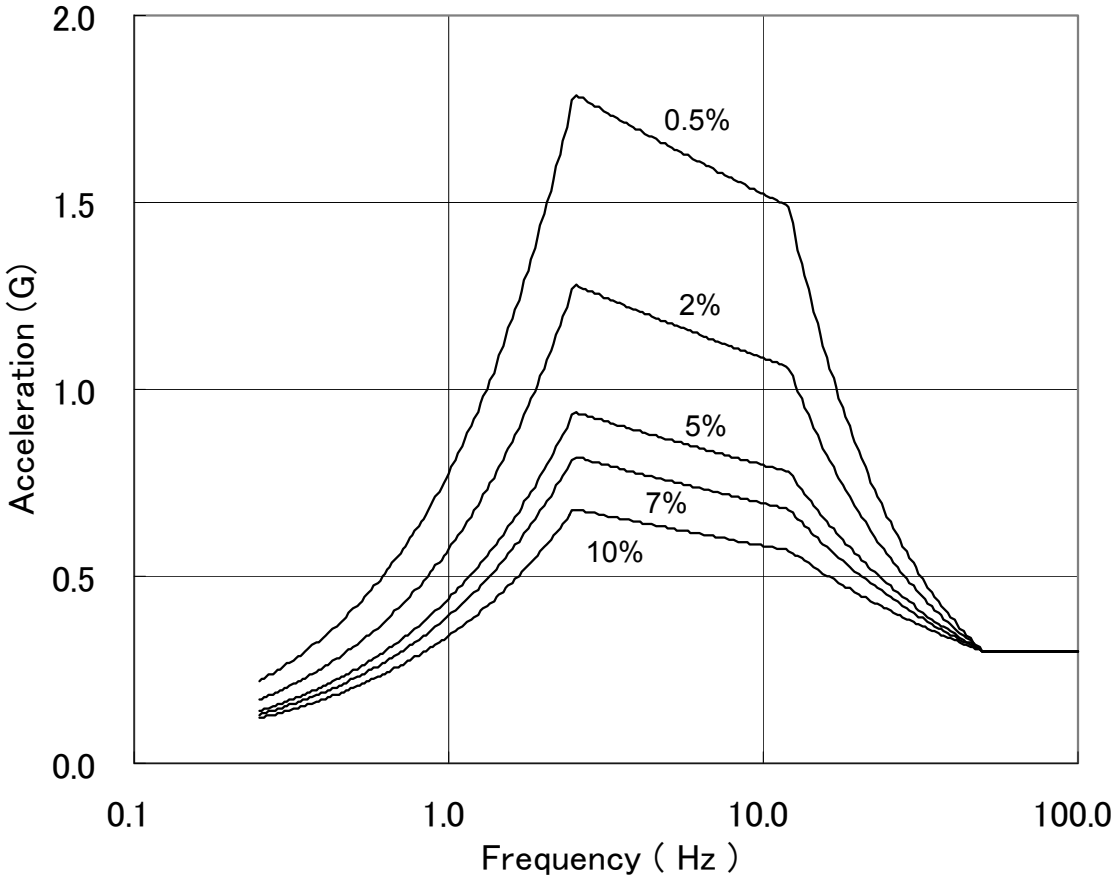
Hydrologic Engineering	
Parameter Description	**Parameter Value**
Maximum flood (or tsunami) level	1 ft below plant grade
Maximum rainfall rate (hourly)	19.4 in/hr for seismic category I/II structures
Maximum rainfall rate (short-term)	6.3 in/5 min for seismic category I/II structures
Maximum groundwater level	1 ft. below plant grade
Geology, Seismology, and Geotechnical Engineering	
Parameter Description	**Parameter Value**
Maximum slope for foundation-bearing stratum	20° from horizontal in untruncated strata
Safe-shutdown earthquake (SSE) ground motion	0.3 g peak ground acceleration
SSE (certified seismic design) horizontal ground response spectra	Regulatory Guide (RG) 1.60, enhanced spectra in high frequency range (See Figure 2.1-1)
SSE (certified seismic design) vertical ground response spectra	RG 1.60, enhanced spectra in high frequency range (See Figure 2.1-2)
Potential for surface tectonic deformation at site	None within the EAB
Subsurface stability – minimum allowable static bearing capacity	15,000 lb/ft^2
Subsurface stability – minimum allowable dynamic bearing capacity, normal conditions plus SSE	60,000 lb/ft^2
Subsurface stability – minimum shear wave velocity at SSE input at ground surface	1,000 ft/s
~~Subsurface stability – shear wave velocity for defining firm rock~~	~~3,500 ft/s~~
~~Subsurface stability – shear wave velocity for defining firm to hard rock~~	~~6,500 ft/s~~
~~Subsurface stability – shear wave velocity for defining hard rock~~	~~8,000 ft/s~~
Subsurface stability – liquefaction potential	None (for seismic category I structures)
Total settlement of R/B complex foundation(14)(15)	6.0 in.
Differential settlement across R/B complex foundation(14)(15)	2.0 in.
Maximum differential settlement between buildings(14)(16)	0.5 in.
Maximum tilt of R/B complex foundation generated during operational life of the plant(14)(16)	1/2000

D

E

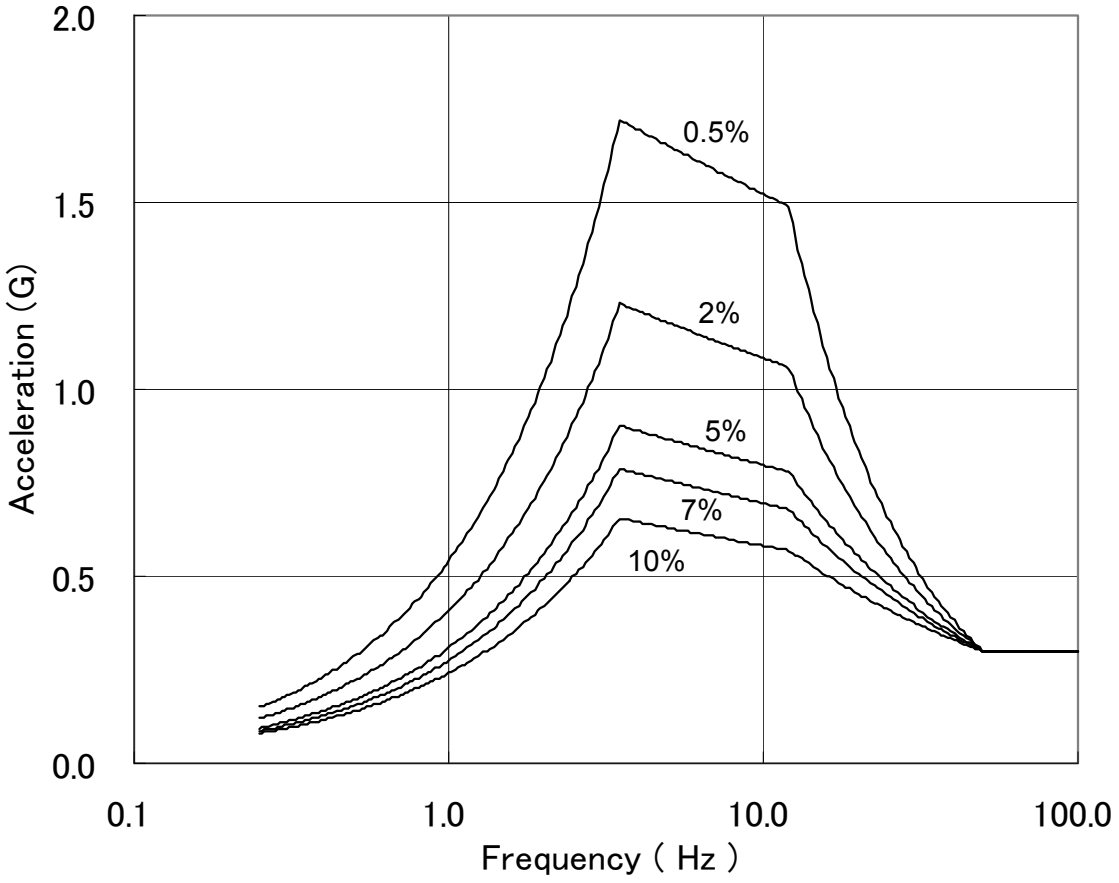
NOTES:

1. The specified missiles are assumed to have a vertical speed component equal to 2/3 of the horizontal speed.
2. These dispersion factors are chosen as the maximum values at all intake points.
3. These dispersion factors are chosen as the maximum values at all inleak points.
4. These dispersion factors are used for a loss-of-coolant accident (LOCA)~~,~~ and a rod ejection accident. F
5. These dispersion factors are used for a loss-of-coolant accident (LOCA), a rod ejection accident, a failure of small lines carrying primary coolant outside containment and a fuel-handling accident inside the containment.
6. These dispersion factors are used for a steam generator (SG) tube rupture, a steam system piping failure, a reactor coolant pump (RCP) rotor seizure, and a rod ejection accident.
7. These dispersion factors are used for a fuel handling accident occurring in the fuel handling and storage area.
8. These dispersion factors are used for a steam system piping failure.
9. These dispersion factors are used for a LOCA. F
10. These dispersion factors are used for a rod ejection accident, a failure of small lines carrying primary coolant outside containment and a fuel-handling accident inside the containment.
11. Normal winter precipitation roof load is determined by converting ground snow load p_g based on the highest ground-level weight of:
    - the 100-year return period snowpack,
    - the historical maximum snowpack,
    - the 100-year return period snowfall event, or
    - the historical maximum snowfall event in the site region.
12. The extreme winter precipitation roof load is based on the sum of the normal ground level winter precipitation plus the highest weight at ground level resulting from either the extreme frozen winter precipitation event or the extreme liquid winter precipitation event. The extreme frozen winter precipitation event is assumed to accumulate on the roof on top of the antecedent normal winter precipitation event. The extreme liquid winter precipitation event may not accumulate on the roof, depending on the geometry of the roof and the type of drainage provided. The extreme winter precipitation roof load is included as live load in extreme loading combinations using the applicable load factor indicated.
13. ~~The 48-hour PMWP is based on interpolation of 24-hour PMP and 72-hour PMP data for the month of March~~Deleted. B
14. Acceptable parameters for settlement without further evaluation.
15. Settlements occurring during construction and operational life. E
16. Settlements occurring during operational life only.



Note: spectra for damping 0.5, 2, 5, 7, 10%.

Figure 2.1-1 US-APWR Certified Seismic Design Response Spectra (Horizontal)



Note: spectra for damping 0.5, 2, 5, 7, 10%.

Figure 2.1-2 US-APWR Certified Seismic Design Response Spectra (Vertical)

2.7.1.3 Main Condenser

This component does not require ITAAC. A

~~2.7.1.3.1 Design Description~~

~~System Purpose and Functions~~

~~The main condenser is non-safety-related system. The main condenser functions to condense and deaerate the exhaust steam from the main turbine and provide a heat sink for the turbine bypass system.~~

~~Location and Functional Arrangement~~

~~The main condenser is located in the turbine building. The main condenser contains three shells, and each shell is located beneath its respective low-pressure turbine.~~

~~Key Design Features~~

~~The main condenser is designed to receive and condense the rated power exhaust steam flow from the low-pressure turbines and to function as a reservoir for vents and drains from various components.~~

~~Seismic and ASME Code Classifications~~

~~The main condenser is non-seismic category and is not designed to ASME code specifications.~~

~~System Operation~~

~~There is no important system operation.~~

~~Alarms, Displays, and Controls~~

~~There are no important alarms, displays, and controls.~~

~~Logic~~

~~There is no logic needed for direct safety functions related to the main condenser.~~

~~Interlocks~~

~~There are no interlocks needed for direct safety functions related to the main condenser.~~

~~Class 1E Electrical Power Sources and Divisions~~

~~Not applicable.~~

~~Equipment to be Qualified for Harsh Environments~~

~~Not applicable.~~

~~Interface Requirements~~

~~There are no safety-related interfaces with systems outside of the certified design.~~

~~Numeric Performance Values~~

~~Not applicable.~~

~~2.7.1.3.2 Inspections, Tests, Analyses, and Acceptance Criteria~~

~~Table 2.7.1.3-1 describes the ITAAC for the Main Condenser.~~

~~Table 2.7.1.3-1 Main Condenser Inspections, Tests, Analyses, and Acceptance Criteria~~

~~Design Commitment~~	~~Inspections, Tests, Analyses~~	~~Acceptance Criteria~~
~~1. The functional arrangement of the main condenser is as described in Subsection 2.7.1.3.1 Design Description.~~	~~1. Inspections of the as-built system will be performed.~~	~~1. The as-built condenser conforms with the functional arrangement as described in Subsection 2.7.1.3.1 Design Description~~

2.7.1.4 Main Condenser Evacuation System (MCES)

This system does not require ITAAC. A

~~2.7.1.4.1 Design Description~~

~~System Purpose and Functions~~

~~The MCES is non-safety-related system. The MCES removes noncondensable gases from the main condenser during plant startup and normal operation, and establishes and maintains a vacuum in the main condenser.~~

~~Location and Functional Arrangement~~

~~The MCES is located in the turbine building. The MCES consists of the condenser vacuum pumps, piping, valves, and instrumentation.~~

~~Key Design Features~~

~~The MCES is designed to remove noncondensable gases from the main condenser during plant startup and normal operation, and to exhaust them to the environment.~~

~~Seismic and ASME Code Classifications~~

~~The MCES is non-seismic category and is not designed to ASME code specifications.~~

~~System Operation~~

~~There is no important system operation.~~

~~Alarms, Displays, and Controls~~

~~There are no important alarms, displays, and controls.~~

~~Logic~~

~~There is no logic needed for direct safety functions related to the MCES.~~

~~Interlocks~~

~~There are no interlocks needed for direct safety functions related to the MCES.~~

~~Class 1E Electrical Power Sources and Divisions~~

~~Not applicable.~~

~~**Equipment to be Qualified for Harsh Environments**~~

~~Not applicable.~~

~~**Interface Requirements**~~

~~There are no safety-related interfaces with systems outside of the certified design.~~

~~**Numeric Performance Values**~~

~~Not applicable.~~

~~**2.7.1.4.2 Inspections, Tests, Analyses, and Acceptance Criteria**~~

~~Table 2.7.1.4-1 describes the ITAAC for the MCES.~~

~~**Table 2.7.1.4-1 Main Condenser Evacuation System Inspections, Tests, Analyses, and Acceptance Criteria**~~

~~Design Commitment~~	~~Inspections, Tests, Analyses~~	~~Acceptance Criteria~~
~~1. The functional arrangement of the main condenser evacuation system is as described in Subsection 2.7.1.4.1 Design Description.~~	~~1. Inspections of the as-built system will be performed.~~	~~1. The as-built main condenser evacuation system conforms to the functional arrangement as described in the Design Description of this Subsection 2.7.1.4.1.~~

2.7.1.5 Gland Seal System (GSS)

This system does not require ITAAC. A

~~2.7.1.5.1 Design Description~~

~~System Purpose and Functions~~

~~The GSS is non safety-related system. The gland seal system prevents air leakage into and steam leakage out of the casings of the turbine generator (T/G).~~

~~Location and Functional Arrangement~~

~~GSS components and piping are located in the T/B. The GSS consists of:~~

- ~~A gland steam condenser with motor driven exhaust fans~~
- ~~The seal pressure regulator~~
- ~~Sealing steam header~~
- ~~The associated piping, valves, and controls~~

~~Key Design Features~~

~~Sealing steam is supplied to the turbine shaft seals from either the ASSS, or the MSS extracted from main steam header. The system returns the steam-air mixture from the turbine glands to the gland steam condenser and exhausts non-condensable gases into the atmosphere.~~

~~Seismic and ASME Code Classifications~~

~~The GSS is non-seismic category and is not designed to ASME code specifications.~~

~~System Operation~~

~~There is no important system operation.~~

~~Alarms, Displays, and Controls~~

~~There are no important alarms, displays, and controls.~~

~~Logic~~

~~There is no logic needed for direct safety functions related to the GSS.~~

~~Interlocks~~

~~There are no interlocks needed for direct safety functions related to the GSS.~~

~~Class 1E Electrical Power Sources and Divisions~~

~~Not applicable.~~

~~Equipment to be Qualified for Harsh Environments~~

~~Not applicable.~~

~~Interface Requirements~~

~~There are no safety-related interfaces with systems outside of the certified design.~~

~~Numeric Performance Values~~

~~Not applicable.~~

~~2.7.1.5.2 Inspections, Tests, Analyses, and Acceptance Criteria~~

~~Table 2.7.1.5-1 describes the ITAAC for the GSS.~~

~~Table 2.7.1.5-1 Gland Seal System Inspections, Tests, Analyses, and Acceptance Criteria~~

~~Design Commitment~~	~~Inspections, Tests, Analyses~~	~~Acceptance Criteria~~
~~1. The functional arrangement of the gland seal system is as described in Subsection 2.7.1.5.1 Design Description.~~	~~1. Inspections of the as-built system will be performed.~~	~~1. The as-built turbine gland seal system conforms to the functional arrangement as described in the Design Description of this Subsection 2.7.1.5.1.~~

2.7.1.6 Turbine Bypass System (TBS)

2.7.1.6.1 Design Description

~~**System Purpose and Functions**~~

The TBS is non safety-related system. The TBS is part of the Main Steam Supply System (MSS) and provides the ~~cap~~ability to send the main steam flow from the steam generators to the main condenser through fifteen turbine bypass valves, thus bypassing the main turbine. The TBS is designed to sustain a 100% load rejection (electrical load), without generating a reactor trip, and ~~not~~without requiring actuation of the main steam relief valves, main steam safety valves, and pressurizer safety valves. The TBS is located in the turbine building. A B

1. The functional arrangement of the TBS is as described in the Design Description of Subsection 2.7.1.6.1. C

~~**Location and Functional Arrangement**~~ D

~~TBS is located in the turbine building.~~

~~**Key Design Features**~~

~~The TBS is designed to sustain a 100% load rejection (electrical load), without generating a reactor trip, and not requiring actuation of main steam relief valve, main steam safety valve and pressurizer safety valve.~~ E

~~**Seismic and ASME Code Classifications**~~

~~The TBS is non-seismic category and is not designed to ASME code specifications.~~ F

~~**System Operation**~~

~~There is no important system operation.~~

~~**Alarms, Displays, and Controls**~~

~~There are no important alarms, displays, and controls.~~

~~**Logic**~~

~~There is no logic needed for direct safety functions related to the TBS.~~

~~**Interlocks**~~

~~There are no interlocks needed for direct safety functions related to the TBS.~~

~~**Class 1E Electrical Power Sources and Divisions**~~

~~Not applicable.~~

~~**Equipment to be Qualified for Harsh Environments**~~

~~Not applicable.~~

~~**Interface Requirements**~~

~~There are no safety-related interfaces with systems outside of the certified design.~~

~~**Numeric Performance Values**~~

~~Not applicable.~~

2.7.1.6.2 Inspections, Tests, Analyses, and Acceptance Criteria~~.~~

Table 2.7.1.6-1 describes the ITAAC for the TBS.

Table 2.7.1.6-1 Turbine Bypass System Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The functional arrangement of the TBS is as described in the Design Description of Subsection 2.7.1.6.1 ~~Design Description~~.	1. ~~An~~ I~~i~~nspection of the as-built TBS ~~system~~ will be performed.	1. The as-built TBS conforms ~~with~~ to the functional arrangement as described in the Design Description of ~~this~~ Subsection 2.7.1.6.1.

A

2.7.1.7 Circulating Water System (CWS)

This system does not require ITAAC.

~~2.7.1.7.1 Design Description~~

~~System Purpose and Functions~~

~~The CWS is non safety-related system. The CWS supplies cooling water to remove heat from the main condenser under varying conditions of power plant operation and site environmental conditions.~~

~~Location and Functional Arrangement~~

~~The CWS is located partly outside and partly in the turbine building. The CWS consists of:~~

- ~~Circulating water pumps~~
- ~~The main condenser~~
- ~~Associated piping, instrumentation, and controls~~

~~Key Design Features~~

~~The CWS removes plant heat during startup, normal operation, shutdown, transient condition, or turbine trip, when a portion of the main steam is bypassed to the main condenser via the turbine bypass valves (TBVs).~~

~~Seismic and ASME Code Classifications~~

~~The CWS is non-seismic category and is not designed to ASME code specifications.~~

~~System Operation~~

~~There is no important system operation.~~

~~Alarms, Displays, and Controls~~

~~There are no important alarms, displays, and controls.~~

~~Logic~~

~~There is no logic needed for direct safety functions related to the CWS.~~

~~Interlocks~~

~~There are no interlocks needed for direct safety functions related to the CWS.~~

~~Class 1E electrical Power Sources and Divisions~~

~~Not applicable.~~

~~Equipment to be Qualified for Harsh Environments~~

~~Not applicable.~~

~~Interface Requirements~~

~~There are no safety-related interfaces with systems outside of the certified design.~~

~~Numeric Performance Values~~

~~Not applicable.~~

~~2.7.1.7.2 Inspections, Tests, Analyses, and Acceptance Criteria.~~

~~Table 2.7.1.7-1 describes the ITAAC for the CWS.~~

~~Table 2.7.1.7-1 Circulating Water System Inspections, Tests, Analyses, and Acceptance Criteria~~

~~Design Commitment~~	~~Inspections, Tests, Analyses~~	~~Acceptance Criteria~~
~~1. The functional arrangement of the circulating water system is as described in Subsection 2.7.1.7.1 Design Description.~~	~~1. Inspections of the as-built system will be performed.~~	~~1. The as-built circulating water system conforms to the functional arrangement as described in the Design Description of this Subsection 2.7.1.7.1.~~

2.7.1.8 Condensate Polishing System (CPS)

A

This system does not require ITAAC.

~~2.7.1.8.1 Design Description~~

~~System Purpose and Functions~~

~~The CPS is non safety-related system. The CPS removes dissolved ionic solids and impurities from the condensate.~~

~~Location and Functional Arrangement~~

~~The CPS is located in the T/B. The CPS consists of:~~

- ~~Condensate prefilters, polishing vessels and their resin traps~~
- ~~A spent resin holding vessel~~
- ~~A portable resin addition hopper and eductor~~
- ~~A resin mixing and holding vessel~~
- ~~Interconnecting piping, instrumentation, and controls~~

~~Key Design Features~~

~~The CPS is designed to remove dissolved ionic solids and impurities from the condensate and assists in the removal of corrosion products.~~

~~Seismic and ASME Code Classifications~~

~~The CPS is non-seismic category and is not designed to ASME code specifications.~~

~~System Operation~~

~~There is no important system operation.~~

~~Alarms, Displays, and Controls~~

~~There are no important alarms, displays, and controls.~~

~~Logic~~

~~There is no logic needed for direct safety functions related to the CPS.~~

~~Interlocks~~

~~There are no interlocks needed for direct safety functions related to the CPS.~~

~~Class 1E Electrical Power Sources and Divisions~~

~~Not applicable.~~

~~Equipment to be Qualified for Harsh Environments~~

~~Not applicable.~~

~~Interface Requirements~~

~~There are no safety-related interfaces with systems outside of the certified design.~~

~~Numeric Performance Values~~

~~Not applicable.~~

~~2.7.1.8.2 Inspections, Tests, Analyses, and Acceptance Criteria.~~

~~Table 2.7.1.8-1 describes the ITAAC for the CPS.~~

~~Table 2.7.1.8-1 Condensate Polishing System Inspections, Tests, Analyses, and Acceptance Criteria~~

~~Design Commitment~~	~~Inspections, Tests, Analyses~~	~~Acceptance Criteria~~
~~1. The functional arrangement of the condensate polishing system is as described in Subsection 2.7.1.8.1 Design Description.~~	~~1. Inspections of the as-built system will be performed.~~	~~1. The as-built condensate polishing system conforms to the functional arrangement as described in the Design Description of this Subsection 2.7.1.8.1.~~

2.7.1.12 Secondary Side Chemical Injection System (SCIS)

A

This system does not require ITAAC.

~~2.7.1.12.1Design Description~~

~~System Purpose and Functions~~

~~The SCIS is non safety-related system. The SCIS is designed to maintain noncorrosive conditions within the secondary loop.~~

~~Location and Functional Arrangement~~

~~The SCIS components are located partly in the turbine building and partly outdoors. The SCIS includes the chemical addition tanks, injection pumps, bulk chemical system, piping and instrumentation.~~

~~Key Design Features~~

~~The SCIS feeds required chemicals to control pH and dissolved oxygen content of the feedwater, condensate and steam generator secondary side water.~~

~~Seismic and ASME Code Classifications~~

~~The SCIS is non-seismic category and is not designed to ASME code specifications.~~

~~System Operation~~

~~There is no important system operation.~~

~~Alarms, Displays, and Controls~~

~~There are no important alarms, displays, and controls.~~

~~Logic~~

~~There is no logic needed for direct safety functions related to the SCIS.~~

~~Interlocks~~

~~There are no interlocks needed for direct safety functions related to the SCIS.~~

~~Class 1E Electrical Power Sources and Divisions~~

~~Not applicable.~~

~~Equipment to be Qualified for Harsh Environments~~

~~Not applicable.~~

~~**Interface Requirements**~~

~~There are no safety-related interfaces with systems outside of the certified design.~~

~~**Numeric Performance Values**~~

~~Not applicable.~~

~~**2.7.1.12.2Inspections, Tests, Analyses, and Acceptance Criteria**~~

~~Table 2.7.1.12-1 describes the ITAAC for the SCIS.~~

~~**Table 2.7.1.12-1 Secondary Side Chemical Injection System Inspections, Tests, Analyses, and Acceptance Criteria**~~

~~Design Commitment~~	~~Inspections, Tests, Analyses~~	~~Acceptance Criteria~~
~~1. The functional arrangement of the chemical injection system is as described in Subsection 2.7.1.12.1 Design Description.~~	~~1. Inspections of the as-built system will be performed.~~	~~1. The as-built chemical injection system conforms to the functional arrangement as described in the Design Description of this Subsection 2.7.1.12.1.~~

2.7.1.13 Auxiliary Steam Supply System (ASSS)

A

This system does not require ITAAC.

~~**2.7.1.13.1Design Description**~~

~~**System Purpose and Functions**~~

~~The ASSS is non safety-related system. The ASSS is designed to provide the steam required for plant use during plant startup, shutdown, and normal operation.~~

~~**Location and Functional Arrangement**~~

~~The auxiliary boiler and associated equipment are located outside, and the common equipment is located in the auxiliary building.~~

~~**Key Design Features**~~

~~Steam is supplied from either the auxiliary boiler, main steam or turbine extracting steam.~~

~~**Seismic and ASME Code Classifications**~~

~~The ASSS is non-seismic category and is not designed to ASME code specifications.~~

~~**System Operation**~~

~~There is no important system operation.~~

~~**Alarms, Displays, and Controls**~~

~~There are no important alarms, displays, and controls.~~

~~**Logic**~~

~~There is no logic needed for direct safety functions related to the ASSS.~~

~~**Interlocks**~~

~~There are no interlocks needed for direct safety functions related to the ASSS.~~

~~**Class 1E Electrical Power Sources and Divisions**~~

~~Not applicable.~~

~~Equipment to be Qualified for Harsh Environments~~

~~Not applicable.~~

~~Interface Requirements~~

~~There are no safety-related interfaces with systems outside of the certified design.~~

~~Numeric Performance Values~~

~~Not applicable.~~

~~2.7.1.13.2Inspections, Tests, Analyses, and Acceptance Criteria~~

~~Table 2.7.1.13-1 describes the ITAAC for the ASSS.~~

~~Table 2.7.1.13-1 Auxiliary Steam Supply System Inspections, Tests, Analyses, and Acceptance Criteria~~

~~Design Commitment~~	~~Inspections, Tests, Analyses~~	~~Acceptance Criteria~~
~~1. The functional arrangement of the auxiliary steam system is as described in the Design Description of Subsection 2.7.1.13.~~	~~1. Inspections of the as-built system will be performed.~~	~~1. The as-built auxiliary steam system conforms to the functional arrangement as described in the Design Description of this Subsection 2.7.1.13.1.~~

2.7.3.2 Non- Essential Service Water System

A

This system does not require ITAAC.

~~**2.7.3.2.1Design Description:**~~

~~**System Purpose and Function**~~

~~The non-essential service water system (Non-ESW system) is a non safety-related system, that provides cooling water to remove heat from the turbine component cooling water system (TCS). The heat is removed via turbine component cooling water heat exchanger and discharged to the heat sink via the circulating water system.~~

~~**Location and Functional Arrangement**~~

~~The major components of the Non-ESW system are located in the turbine building.~~

~~**Key Design Features**~~

~~The non-ESW system provides cooling water to the TCS heat exchangers and transfers heat rejected by the TCS to the CWS during all modes of normal plant operation.~~

~~**Seismic and ASME Code Classifications**~~

~~The non-ESW system is non-seismic category and is not designed to ASME code specifications.~~

~~**System Operation**~~

~~There is no important system operation.~~

~~**Alarms, Displays, and Controls**~~

~~There are no important alarms, displays, and controls.~~

~~**Logic**~~

~~There is no logic needed for direct safety functions related to the Non-ESW system.~~

~~**Interlocks**~~

~~There are no interlocks needed for direct safety functions related to the Non-ESW system.~~

~~**Class 1E Electrical Power Sources and Divisions**~~

~~Not applicable.~~

~~**Equipment to be Qualified for Harsh Environments**~~

~~Not applicable.~~

~~Interface Requirements~~

~~There are no safety-related interfaces with systems outside of the certified design.~~

~~Numeric Performance Values~~

~~Not applicable.~~

~~2.7.3.2.2Inspections, Tests, Analysis, and Acceptance Criteria~~

~~Table 2.7.3.2-1 describes the ITAAC for the non-ESW system.~~

~~Design Commitment~~	~~Inspections, Tests, Analyses~~	~~Acceptance Criteria~~
~~1. The functional arrangement of the non-ESW system is as described in the Design Description of Subsection 2.7.3.2.1~~	~~1. Inspection of the as-built non-ESW system will be performed.~~	~~1. The as-built non-ESW system conforms to the functional arrangement described in the Design Description of this Subsection 2.7.3.2.1~~

2.7.3.4 Turbine Component Cooling Water System

A

This system does not require ITAAC.

~~2.7.3.4.1 Design Description~~

~~System Purpose and Functions~~

~~The turbine component cooling water system (TCS) is a non safety-related system. The TCS provides chemically treated, demineralized cooling water for the removal of heat from non safety-related heat exchangers in the turbine building and rejects the heat to the non-ESW system.~~

~~Location and Functional Arrangement~~

~~The major components of the TCS are located in turbine building.~~

~~Key Design Features~~

~~The TCS provides corrosion-inhibited, demineralized cooling water to the turbine building equipment during normal plant operation.~~

~~The heat sink for the TCS is the non-ESW system. The heat is transferred to the non-ESW system through heat exchangers.~~

~~Seismic and ASME Code Classifications~~

~~The TCS is non-seismic category and is not designed to ASME code specifications.~~

~~System Operation~~

~~There is no important system operation.~~

~~Alarms, Displays, and Controls~~

~~There are no important alarms, displays, and controls.~~

~~Logic~~

~~There is no logic needed for direct safety functions related to the TCS.~~

~~Interlocks~~

~~There are no interlocks needed for direct safety functions related to the TCS.~~

~~Class 1E Electrical Power Sources and Divisions~~

~~Not applicable.~~

~~Equipment to be Qualified for Harsh Environments~~

~~Not applicable.~~

~~Interface Requirements~~

~~There are no safety-related interfaces with systems outside of the certified design.~~

~~Numeric Performance Values~~

~~Not applicable.~~

~~2.7.3.4.2 Inspections, Tests, Analysis, and Acceptance Criteria~~

~~Table 2.7.3.4-1 describes the ITAAC for the TCS.~~

~~Table 2.7.3.4-1 Turbine Component Cooling Water System Inspections, Tests, Analyses, and Acceptance Criteria~~

~~Design Commitment~~	~~Inspections, Tests, Analyses~~	~~Acceptance Criteria~~
~~1. The functional arrangement of the TCS is as described in the Design Description of Subsection 2.7.3.4.1.~~	~~1. Inspection of the as-built TCS will be performed.~~	~~1. The as-built TCS conforms to the functional arrangement described in the Design Description of this Subsection 2.7.3.4.1.~~

2.7.5.5 Turbine Building Area Ventilation System

This system does not require ITAAC. A

~~2.7.5.5.1 Design Description~~

~~System Purpose and Functions~~

~~The turbine building area ventilation system is not a safety-related system. This system maintains a suitable environment for the operation of equipment in the turbine building. The turbine building areas are not expected to include airborne radioactive contamination.~~

~~Location and Functional Arrangement~~

~~The turbine building area ventilation system is located inside and on the perimeter of the turbine building. The turbine building area ventilation system includes the following:~~

- ~~General mechanical areas ventilation system~~
- ~~Electrical equipment areas HVAC system~~

~~Key Design Features~~

~~The turbine building area ventilation system has the following design features:~~

- ~~Provide a suitable environment for equipment operation in the building~~
- ~~Provide effective smoke evacuation in the building~~
- ~~Maintain the hydrogen concentration below the explosive limit in the battery room~~

~~Seismic and ASME Code Classifications~~

~~The turbine building area ventilation system is non-seismic category and is not designed to ASME code specifications.~~

~~System Operation~~

~~There is no important system operation.~~

~~Alarms, Displays, and Controls~~

~~There are no important alarms, displays, and controls.~~

~~Logic~~

~~There is no logic needed for direct safety functions related to the turbine building area ventilation system.~~

~~**Interlocks**~~

~~There are no interlocks needed for direct safety functions related to the turbine building area ventilation system.~~

~~**Class 1E Electrical Power Sources and Divisions**~~

~~Not applicable.~~

~~**Equipment to be Qualified for Harsh Environments**~~

~~Not applicable.~~

~~**Interface Requirements**~~

~~There are no safety-related interfaces with systems outside of the certified design.~~

~~**Numeric Performance Values**~~

~~Not applicable.~~

~~**2.7.5.5.2 Inspections, Tests, Analyses, and Acceptance Criteria**~~

~~Table 2.7.5.5-1 describes the ITAAC for the turbine building area ventilation system.~~

~~**Table 2.7.5.5-1: Turbine Building Area Ventilation System Inspections, Tests, Analyses, and Acceptance Criteria**~~

~~Design Commitment~~	~~Inspections, Tests, Analyses~~	~~Acceptance Criteria~~
~~1. The functional arrangement of the turbine building area ventilation system is as described in Section 2.7.5.5.1 Design Description.~~	~~1. Inspections of the as-built turbine building area ventilation system will be performed.~~	~~1. The as-built turbine building area ventilation system conforms to the functional arrangement described in Design Description of this Subsection 2.7.5.5.1.~~

2.7.6.11 Condensate Storage Facilities

A

This system does not require ITAAC.

~~**2.7.6.11.1 Design Description**~~

~~**System Purpose and Functions**~~

~~The condensate storage facilities are not a safety-related system.~~

~~The condensate storage facilities consist of the following:~~

- ~~demineralized water system~~
- ~~condensate storage and transfer system, and~~
- ~~primary makeup water system (PMWS).~~

~~The demineralized water system provides demineralized water for makeup of the condensate storage tank and demineralized water users in the plant.~~

~~The condensate storage and transfer system provides secondary side and condenser hotwell makeup water.~~

~~The PMWS provides deaerated water to primary plant users.~~

~~**Location and Functional Arrangement**~~

~~The major components of the condensate storage facilities are located in the yard.~~

~~The demineralized water system consists of a tank, pumps, and associated valves, piping and instrumentation.~~

~~The condensate storage and transfer system consists of the condensate storage tank, condensate transfer pumps, and associated valves, piping, and instrumentation.~~

~~The PMWS consists of two tanks, pumps, and associated valves, piping and instrumentation.~~

~~**Key Design Features**~~

~~The condensate storage and transfer system is a reservoir to supply or receive condensate water as required by the condenser hotwell level control system.~~

~~**Seismic and ASME Code Classifications**~~

~~The condensate storage facilities are non-seismic category and are not designed to ASME code specifications.~~

System Operation

There is no important system operation.

Alarms, Displays, and Controls

There are no important alarms, displays, and controls.

Logic

There is no logic needed for direct safety functions related to the condensate storage facilities.

Interlocks

There are no interlocks needed for direct safety functions related to the condensate storage facilities.

Class 1E Electrical Power Sources and Divisions

Not applicable.

Equipment to be Qualified for Harsh Environments

Not applicable.

Interface Requirements

There are no safety-related interfaces with systems outside of the certified design.

Numeric Performance Values

Not applicable.

2.7.6.11.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.7.6.11-1 describes the ITAAC for the condensate storage facilities.

Table 2.7.6.11-1 Condensate Storage Facilities Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The functional arrangement of the condensate storage facilities are as described in the Design Description of Subsection 2.7.6.11.	1. Inspections of the as-built system will be performed.	1. The as-built condensate storage facilities conform with the functional arrangement as described in the Design Description of this Subsection 2.7.6.11.

2.7.6.12 Potable and Sanitary Water Systems (PSWS) A

This system does not require ITAAC.

~~2.7.6.12.1 Design Description~~

~~**System Purpose and Functions**~~

~~The PSWS is not a safety-related system. The PSWS provides water for domestic use and human consumption and to collect site sanitary waste for treatment, dilution and discharge during normal operation.~~

~~**Location and Functional Arrangement**~~

~~The system serves all the areas in the turbine building, reactor building, auxiliary building, access building, firehouse and future facilities.~~

~~**Key Design Features**~~

~~The potable water system layout is designed with no interconnection and/or sharing between the systems, or between the units, to prevent contamination due to potential radioactivity, or due to backflow, making water unfit for human consumption.~~ B

~~The sanitary drainage system collects sanitary waste from various plant areas such as restrooms and locker room etc., and carries the wastewater for processing to the treatment facility. The sanitary drainage system does not serve any facilities in the radiological controlled areas.~~

~~**Seismic and ASME Code Classifications**~~

~~The PSWS is non-seismic category and is not designed to ASME Code Section III requirements.~~

~~**System Operation**~~

~~There is no important system operation.~~

~~**Alarms Displays and Controls**~~

~~There are no important alarms, displays, and controls.~~

~~**Logic**~~

~~There is no logic needed for direct safety functions related to the PSWS.~~

~~**Interlocks**~~

~~There are no interlocks needed for direct safety functions related to the PSWS.~~

~~Class 1E Electrical Power Sources and Division~~

~~Not applicable.~~

~~Equipment to be Qualified for Harsh Environments~~

~~Not applicable.~~

~~Interfaces Requirements~~

B

~~The PSWS are interface systems.~~

~~Numeric Performance Values~~

~~Not applicable.~~

~~2.7.6.12.2 Inspections, Tests, Analyses, and Acceptance Criteria~~

~~Table 2.7.6.12-1 provides the inspections, tests, analyses, and associated acceptance criteria for the Potable and Sanitary Water Systems.~~

~~Table 2.7.6.12-1 Potable and Sanitary Water Systems Inspections, Tests, Analyses, and Acceptance Criteria~~

~~Design Commitment~~	~~Inspections, Tests, Analyses~~	~~Acceptance Criteria~~
~~1. The functional arrangement of the PSWS is as described in the design description of this Subsection 2.7.6.12.~~	~~1. Inspection of the as-built PSWS will be performed.~~	~~1. The as-built PSWS conforms with the functional arrangement as described in the Design Description of this Subsection 2.7.6.12.~~

2.8 RADIATION PROTECTION

2.8.1 Design Description

The US-APWR is designed to keep radiation exposures to plant personnel and off-site members of the public within applicable regulatory limits, and as low as reasonably achievable (ALARA).

~~The radiation shielding design (as provided by the plant structures or by shielding included in the design) is adequate so that the maximum radiation levels in plant areas are commensurate with the areas access requirements. The presence of this shielding allows radiation exposures to plant personnel to be maintained ALARA during normal plant operations and maintenance.~~ A A1

~~Adequate shielding is provided for those plant areas that may require occupancy to permit operators to aid in the mitigation of or the recovery from an accident.~~ B

~~The plant provides ventilation flow for the radioactive controlled area to control the concentrations of airborne radioactivity specified in 10 CFR 20 Appendix B.~~ C

Shielding walls and floors for safety-related structures, and the related ITAAC, are identified in Section 2.2, Tables 2.2-2 and 2.2-4, respectively. C1

Area radiation and airborne radioactivity monitoring systems are described in section 2.7.6.13.

1.a. Deleted. D

1.b. Shielding walls and floors in the auxiliary building are provided to ensure maximum radiation levels are maintained within the limits specified in Table 2.8-2. E

2. Deleted. F

3. Ventilation flow for the radioactive controlled area maintains the concentrations of airborne radioactivity within the limits specified in 10 CFR 20, Appendix B. G

2.8.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.8-1 describes the ITAAC~~ or corresponding design acceptance criteria for radiation protection. These ITAAC ensure that all areas of the plant are kept within the limits of each area's radiation zone designation, given in Table 2.8-2~~ for radiation protection. H

Table 2.8-1 Radiation Protection Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1.a ~~Shielding walls and floors listed in Table 2.2-2 are provided to maintain the ensure maximum radiation levels are maintained within the limits specified in Table 2.8-2.~~ Deleted.	1.a ~~Inspections of the as-built shielding walls and floors thicknesses will be performed.~~ ~~Refer to Table 2.2-4 ITAAC Item 1.~~ Deleted.	1.a ~~The as-built shielding walls and floors listed in Table 2.2-2 are consistent with the designed concrete wall and floor thicknesses.~~ ~~Refer to Table 2.2-4 ITAAC Item 1.~~ Deleted.
1.b Shielding walls and floors in the auxiliary building are provided to ~~maintain the~~ ensure maximum radiation levels are maintained within the limits specified in Table 2.8-2.	1.b Inspections of the as-built shielding wall~~s~~ and floor~~s~~ thicknesses in the auxiliary building will be performed.	1.b The as-built shielding walls and floors in the auxiliary building are consistent with the designed concrete wall and floor thicknesses to ensure maximum radiation levels are maintained within the limits specified in Table 2.8-2.
2. ~~Area radiation and airborne radioactivity monitoring systems are provided to monitor radioactivity concentrations.~~ Deleted.	2. ~~Refer to Table 2.7.6.13-3 ITAAC Item 1.~~ Deleted.	2. ~~Refer to Table 2.7.6.13-3 ITAAC Item 1.~~ Deleted.
3. Ventilation flow for the radioactive controlled area ~~is provided to control~~ maintains the concentrations of airborne radioactivity within the limits specified in 10 CFR 20, Appendix B.	~~3. Tests of the as-built containment purge system and auxiliary building HVAC system will be performed.~~ 3.i Analyses will be performed to confirm that the design ventilation flow for the radioactive controlled area maintains the concentrations of airborne radioactivity within the limits specified in 10 CFR 20, Appendix B.	~~3. The as-built containment purge system and auxiliary building HVAC provide ventilation flow to control the concentrations of airborne radioactivity specified in 10 CFR 20 Appendix B.~~ 3.i A report exists and concludes that the design ventilation flow for the radioactive controlled area, as identified in the report, will maintain the concentrations of airborne radioactivity within the limits specified in 10 CFR 20, Appendix B.

	3.ii Testing will be performed to verify that the design ventilation flow for the radioactive controlled area is met.	3.ii The design ventilation flow for the radioactive controlled area is met.

Table 2.8-2 Radiation Zone Designations

Zone	Dose Rate
I	≤0.25 mrem/h
II	≤1.0 mrem/h
III	≤2.5 mrem/h
IV	≤15.0 mrem/h
V	≤100.0 mrem/h
VI	≤1.0 rem/h
VII	≤10.0 rem/h
VIII	≤100.0 rem/h
IX	≤500.0 rad/h
X	>500.0 rad/h

2.10 EMERGENCY PLANNING

This section addresses certain features of the US-APWR plant design that support emergency planning and the capability of the licensee to cope with plant emergencies.

2.10.1 Design Description

Important facilities, design features, and equipment associated with emergency planning include:

- The onsite technical support center (TSC)
- The emergency operations facility (EOF)
- Communication systems for voice and data,
- The emergency response data system~~ (ERDS)~~, and
- The safety parameter display system (SPDS).

The TSC serves as the primary onsite communications center during emergency conditions~~. Located near the main control room (MCR), it provides floor space of at least 1875 ft^2 (75 ft^2 for each of at least 25 personnel), along with equipment for~~ and is equipped with voice and data communications ~~and~~ systems for processing and displaying information. ~~In addition, t~~The TSC also provides a habitable working ~~space~~ environment as described in~~in accordance with~~ Subsection 2.7.5.4.1.4. A B

The EOF is a support facility that provides additional capabilities for managing a plant emergency~~ from a near-site location~~. Subsections 2.7.6.10 and 2.5.4 describe communication and information systems, including the emergency response data system and SPDS, that are available in the MCR, TSC, and EOF.~~This facility houses equipment important to emergency planning as indicated below.~~ C D

~~The communication systems include voice communication system and data communication system. The data communication system provides for plant data exchange among the MCR, the TSC, and the EOF. It also supports the ERDS.~~ E

~~The ERDS is an emergency response data system that provides a data link between the licensee's computer system and the NRC Operations Center, with automated transmission of data associated with selected plant parameters to facilitate NRC support in an emergency.~~ F

~~The SPDS in the MCR displays plant parameters that allow operators to rapidly assess plant safety status both during normal operations and in emergencies. This system is duplicated in the TSC and the EOF. This arrangement improves communications among these three areas and facilitates decision making in an emergency.~~ G

1. The TSC floor space is at least 1875 ft^2. H

2. The TSC is located close to the MCR.

3. Deleted.

4. Deleted.

2.10.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.10-1 describes ITAAC for emergency planning.

Table 2.10-1 Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The TSC floor space is at least 1875 ft^2 ~~(75 ft^2 for each of at least 25 persons)~~.	1. An inspection and analysis of the as-built TSC floor area will be performed.	1. A report exists and concludes that ~~T~~the as-built TSC has at least 1875 ft^2 of floor space.
2. The TSC is located close to the MCR.	2. An inspection will be performed for the location of the as-built TSC relative to the as-built MCR.	2. ~~Walking between the as-built TSC and MCR takes no more than 2 minutes.~~TSC is located in the access building on the same floor level as the MCR.
3. ~~The TSC provides a habitable workspace environment.~~Deleted.	3. ~~See Table 2.7.5.4-3, ITAAC Item 8.~~Deleted.	3. ~~See Table 2.7.5.4-3, ITAAC Item 8.~~Deleted.
4. ~~Adequate emergency communications systems are in place.~~Deleted.	4. ~~See Table 2.7.6.10-1, ITAAC Items 2, 3, and 4 and Table 2.9-1, ITAAC Items 7.k and 7.l.~~Deleted.	4. ~~See Table 2.7.6.10-1, ITAAC Items 2, 3, and 4 and Table 2.9-1, ITAAC Items 7.k and 7.l.~~Deleted.

2.12 PHYSICAL SECURITY HARDWARE

2.12.1 Design Description

The physical security system provides physical features to detect, delay, assist response to, and defend against the design basis threat (DBT) for radiological sabotage. Key elements of the physical security system design for the US-APWR standard plant certified design ~~are:~~consist of physical barriers, an intrusion detection system, and communication systems. A

~~•~~ 1.a Vital equipment is located only within vital areas.

1.b Reserved. B

2.a Reserved.

2.b Reserved.

2.c Reserved.

3.a Reserved.

3.b Reserved.

3.c Reserved.

4.a Reserved.

4.b Reserved.

4.c Reserved.

5. Reserved.

~~•~~ 6.a The external walls, doors, ceiling and floors in the main control room and the central alarm station are bullet resistant.

6.b Reserved. C

7. Reserved.

8.a Reserved.

8.b Reserved.

9 Reserved.

10.a Unoccupied vital areas are locked and alarmed with activated intrusion detection systems that annunciate in the central alarm station.

10.b Reserved. D

11.a.i Security alarm annunciation and video assessment information are available in the central alarm station.

11.a.ii Reserved. E

11.b.i The central alarm station is located inside a protected area and the interior of the alarm station is not visible from the perimeter of the protected area.

11.b.ii Reserved. F

11.c Reserved.

11.d Reserved.

11.e Reserved.

12. The secondary security power supply system for alarm annunciator equipment and non-portable communications equipment is located within a vital area.

13.a Security alarm devices including transmission lines to annunciators are tamper indicating and self-checking (i.e., an automatic indication is provided when failure of the alarm system or a component occurs or when on standby power), and alarm annunciation indicates the type of alarm (e.g., intrusion alarms, emergency exit alarm, etc.) and location.

13.b.i Intrusion detection and assessment systems are designed to provide visual display and audible annunciation of alarms in the central alarm station.

13.b.ii Reserved. G

14. Intrusion detection systems equipment ~~exists to~~ records onsite security alarm annunciation including the location of the alarm, false alarm, alarm check, and tamper indication and the type of alarm, location, alarm circuit, date~~,~~ and time ~~and disposition of each alarm is recorded~~. H

15.a Emergency exits through vital area boundaries are alarmed and secured by locking devices that allow prompt egress during an emergency.

15.b Reserved. I

16.a.i The central alarm station has conventional (land line) telephone service with local law enforcement authorities and a system for communication with the main control room ~~and is capable of continuous communication with security personnel~~. J

16.a.ii Reserved. K

16.b.i The central alarm station is capable of continuous communication with security personnel.

16.b.ii Reserved.

16.c.i Nonportable communications equipment in the central alarm station remains operable from an independent power source in the event of loss of normal power. L

16.c.ii Reserved.

2.12.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.12-1 provides the ITAAC for the physical security hardware.

Table 2.12-1 Physical Security Hardware Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 1 of 4)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1.a ~~Vital Equipment~~ Vital equipment is located only within a vital area.	1.a Inspections will be performed of vital equipment locations.	1.a. Vital equipment is located only within a vital area.
1.b Reserved.	1.b Reserved.	1.b. Reserved.
2.a Reserved.	2.a Reserved.	2.a Reserved.
2.b Reserved.	2.b Reserved.	2.b. Reserved.
2.c Reserved.	2.c Reserved.	2.c. Reserved.
3.a Reserved.	3.a Reserved.	3.a Reserved.
3.b Reserved.	3.b Reserved.	3.b Reserved.
3.c Reserved.	3.c Reserved.	3.c Reserved.
4.a Reserved.	4.a Reserved.	4.a Reserved.
4.b Reserved.	4.b Reserved.	4.b Reserved.
4.c Reserved.	4.c Reserved.	4.c Reserved.
5. Reserved.	5. Reserved.	5. Reserved.
6.a The external walls, doors, ceiling and floors in the main control room and the central alarm station are bullet resistant.	6.a Type test, analysis or a combination of type test and analysis of the external walls, doors, ceilings, floors in the main control room and the central alarm station will be performed.	6.a A report exists and concludes that the external walls, doors, ceilings, floors in the main control room and the central alarm station are bullet resistant to UL 752 (2006) level 4.
6.b Reserved.	6.b Reserved.	6.b Reserved.
7. Reserved.	7. Reserved.	7. Reserved.
8.a Reserved.	8.a Reserved.	8.a Reserved.
8.b Reserved.	8.b Reserved.	8.b Reserved.
9. Reserved.	9. Reserved.	9. Reserved.

Table 2.12-1 Physical Security Hardware Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 2 of 4)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
10.a Unoccupied vital areas are locked and alarmed with activated intrusion detection systems that annunciate in the central alarm station.	10.a Tests, inspections, or a combination of tests and inspections of unoccupied vital areas intrusion detection equipment and locking devices will be performed.	10.a Unoccupied vital areas are locked and intrusion is detected and annunciated in the central alarm station.
10.b Reserved.	10.b Reserved.	10.b Reserved.
11.a.i Security alarm annunciation and video assessment information are available in the central alarm station	11.a.i Tests, inspections or a combination of tests and inspections of alarm annunciation and video assessment equipment will be performed.	11.a.i Security alarm annunciation and video assessment information is available in the central alarm station. .
11.a.ii Reserved	11.a.ii Reserved	11.a.ii Reserved
11.b.i The central alarm station is located inside a protected area and the interior is not visible from the perimeter of the protected area	11.b.i Inspection of the central alarm station location will be performed.	11.b.i The central alarm station is located inside a protected area and the interior of the central alarm station is not visible from the perimeter of the protected area.
11.b.ii Reserved	11.b.ii Reserved	11.b.ii Reserved
11.c Reserved	11.c Reserved	11.c Reserved
11.d Reserved	11.d Reserved	11.d Reserved
11.e Reserved	11.e Reserved	11.e Reserved
12. Secondary security power supply system for alarm annunciator equipment and non-portable communications equipment is located within a vital area.	12. Inspections of the secondary security power supply system will be performed.	12. The secondary security power system for alarm annunciator equipment and non-portable communications equipment is located within a vital area.

Table 2.12-1 Physical Security Hardware Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 3 of 4)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
13.a Security alarm devices including transmission lines to annunciators are tamper indicating and self-checking, (e.g. an automatic indication is provided when failure of the alarm system or a component occurs or when on standby power), and alarm annunciation indicates the type of alarm, (e.g., intrusion alarms, emergency exit alarm, etc.) and location.	13.a Tests will be performed on security alarm devices and transmission lines.	13.a Security alarm devices including transmission lines to annunciators are tamper indicating and self-checking (e.g., an automatic indication is provided when failure of the alarm system or a component occurs, or when the system is on standby power) and the alarm annunciation indicates the type of alarm, (e.g., intrusion alarms, emergency exit alarm, etc.) and location.
13.b.i Intrusion detection and assessment systems are designed to provide visual display and audible annunciation of alarms in the central alarm station.	13.b.i Tests will be performed on Intrusion detection and assessment systems.	13.b.i The intrusion detection system provides a visual display and audible annunciation of alarms in the central alarm station.
13.b.ii Reserved	13.b.ii Reserved	13.b.ii Reserved
14. Intrusion detection systems equipment ~~exists to~~ records onsite security alarm annunciation including the location of the alarm, false alarm, alarm check, and tamper indication and the type of alarm, location, alarm circuit, date~~,~~ and time ~~and disposition of each alarm is recorded~~.	14. Tests will be performed on the intrusion detection systems recording equipment	14. Intrusion detection systems recording equipment is capable of recording each onsite security alarm annunciation including the location of the alarm, false alarm, alarm check, and tamper indication and the type of alarm, location, alarm circuit, date~~,~~ and time ~~and disposition of each alarm is recorded~~.
15.a Emergency exits through vital area boundaries are alarmed and secured by locking devices that allow prompt egress during an emergency.	15.a Test, inspection or a combination of tests and inspections of emergency exits through vital area boundaries will be performed.	15.a Emergency exits through vital area boundaries are alarmed. and secured by locking devices that allow prompt egress during an emergency.
15.b Reserved.	15.b Reserved.	15.b Reserved.

Table 2.12-1 Physical Security Hardware Inspections, Tests, Analyses, and Acceptance Criteria (Sheet 4 of 4)

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
16.a.i The central alarm station has conventional (land line) telephone service with local law enforcement authorities and a system for communication with the main control room.	16.a.i Tests, inspections or a combination of tests and inspections of the central alarm station communications capability with local law enforcement authorities and main control room will be performed.	16.a.i The central alarm station is equipped with conventional (land line) telephone service with local law enforcement authorities and has a system for ~~continuous~~ communication with the main control room.
16.a.ii Reserved	16.a.ii Reserved	16.a.ii Reserved
16.b.i The central alarm station is capable of continuous communication with security personnel.	16.b.i Tests, inspections or a combination of tests and inspections of the central alarm station continuous communication capabilities will be performed.	16.b.i The central alarm station is capable of continuous communication with security officers, watchmen or armed response individuals, or other security personnel that have responsibilities during a contingency response event.
16.b.ii Reserved	16.b.ii Reserved	16.b.ii Reserved
16.c.i Nonportable communications equipment in the central alarm station remains operable from an independent power source in the event of loss of normal power.	16.c.i Tests, inspections, or a combination of tests and inspections of the nonportable communications equipment will be performed.	16.c.i All nonportable communication devices (including conventional telephone systems) in the central alarm station are wired to an independent power supply that enables those systems to remain operable (without disruption) during the loss of normal power.
16.c.ii Reserved	16.c.ii Reserved	16.c.ii Reserved

2.13 DESIGN RELIABILITY ASSURANCE PROGRAM

2.13.1 Design Description

The purpose~~s~~ of the US-APWR design reliability assurance program (D-RAP) ~~are~~is to provide reasonable assurance that: A

- The US-APWR is designed, constructed, and operated in a manner that is consistent with the assumptions and risk insights for the risk-significant structures, systems, and components (SSCs).
- The risk-significant SSCs do not degrade to an unacceptable level during plant operations.
- The frequency of transients that challenge risk-significant SSCs is minimized.
- The risk-significant SSCs function reliably when challenged.

The risk-significant SSCs including both safety-related and non safety-related SSCs are identified for inclusion in the D-RAP ~~through utilizing~~using the results of ~~a~~ the probabilistic risk assessment (PRA), an expert panel, deterministic methods, or other means~~methods for inclusion in the program~~. B

1. The D-RAP provides reasonable assurance that the plant is designed and constructed in a manner that is consistent with the key assumptions and risk insights for risk-significant SSCs. C

2.13.2 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.13-1 describes the ITAAC for the D-RAP.

Table 2.13-1 Design Reliability Assurance Program Inspections, Tests, analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. The D-RAP provides reasonable assurance that the plant is designed and constructed in a manner that is consistent with the key assumptions and risk insights for risk-significant SSCs.	1. An analysis will confirm the adequacy of the D-RAP.	1. A report exists that includes the following three (3) major elements: · Identification of all as-built SSCs in the scope of the D-RAP · Description of the methodology used to identify the as-built SSCs in the scope of the D-RAP · For the as-built SSCs in the scope of D-RAP, identify and describe the reliability assurance activities that are accomplished prior to the initial fuel load, which provide reasonable assurance that the plant is designed and constructed in a manner that is consistent with the key assumptions (including reliability and availability assumptions in the PRA, when applicable) and risk insights for the risk-significant SSCs.

2.14 INITIAL TEST PROGRAM

2.14.1 Design Description

This section represents a commitment that combined license applicants referencing the certified design implement an initial test program (ITP). A

The ~~initial test program (~~ITP~~)~~ of the US-APWR is described in this section. Activities associated with the ITP are part of the initial plant startup. The ITP consists of preoperational and initial startup tests and is conducted in accordance with an approved manual containing ITP administrative controls. ~~The successful completion of inspections, tests, analyses, and acceptance criteria (ITAAC) is a prerequisite for fuel loading.~~ B J

The ITP administrative manual controls the qualification of the ITP participants, test procedure development, review, approval, ~~and~~ evaluation of test results, and test record retention including test procedures. ~~The manual also assures that qualified personnel manage, develop, and conduct the ITP.~~ Tests are conducted in accordance with individual approved test procedures. Copies of ~~T~~the approved test procedures are made available to ~~the~~ NRC personnel prior to their intended use for the preoperational tests and prior to the scheduled initial fuel loading for the startup tests. B C D

~~Construction and preliminary tests and inspections typically consist of activities such as hydrostatic pressure tests, flushing, cleaning, wiring continuity and separation checks, initial instrument calibrations, valve functional checks, motor rotational checks, and functional tests of components.~~ E

~~Following plant construction and construction tests, p~~Preoperational tests are conducted to demonstrate that SSCs operate in accordance with the design. The preoperational tests include, as appropriate, functional tests, logic and interlock tests, system operational and performance tests, and expansion and vibration measurements. F G

The initial fuel loading marks the beginning of startup tests. Startup tests are performed after completion of preoperational tests to demonstrate that plant systems meet performance requirements ~~and design criteria~~ and that the plant can operate in an integrated fashion. Startup tests include initial fuel loading, initial criticality, low power testing ~~(less than 5% power)~~, and power ascension testing. H I

Power ascension tests are performed once the operating characteristics of the reactor are verified during low power tests. During power ascension testing, the power level is increased to full licensed power in prescribed stages defined in approved test procedures. I

2.14.2 Inspections, Tests, Analyses, and Acceptance Criteria

This section does not include ITAAC.