ESBWR Certification

Probabilistic Risk Assessment

Section 4 Changes From Revision 1 to Revision 2

	Location (e.g., subsection with paragraph/sentence/item , table with column/row, or figure)	**Description of Change**
1.	S4.0.1, 1st, 2nd, 8th, 10th thru 12th Bullets	Rewritten for consistency of revised titling scheme.
2.	S4.0.2, 2nd para, last sent	Deleted to be consistent with Table 4.0-1.
3.	T4.0-1	Updated to reflect the system models used in Rev. 2. To address RAI 19.1-42, the table content has been Updated to clarify the system descriptions modeled in PRA.
4.	S4.0.3	Additional information provided for clarity with General Assumptions and Modeling Groundrules added.
5.	S4.0.4	Added a new subsection to replace Appendix 4.A
6.	S4A	Appendix A.4 is moved to section 4.04.
7.	S4.1 Title	Rewritten for consistency with titling scheme.
8.	S4.1.2, Title	Rewritten for consistency with titling scheme.
9.	S4.1.2, entire subsection	Rewritten for clarification with additional information provided in response to RAI 19.1-46D
10.	S4.1.3.1, 1st para	Deleted the references to 200 mm inlets and 250 mm outlets since the SRV sizing is not finalized, plus this information is not necessary in the PRA documentation.
11.	S4.1.3.1, 2nd para, 3rd sent	Deleted reference to the vacuum breakers since credit is not given to these vacuum breakers in the model, and this sentence is not appropriate.
12.	S4.1.3.1, 3rd & 5th para	Rewritten for clarity in response to RAI 19.1-46A/B.
13.	S4.1.3.2	Rewritten for clarity.
14.	S4.1.3.3, 1st para, 2nd sent	Rewritten for clarity with additional information provided in response to RAI 19.1-46E.
15.	S4.1.4	Rewritten for clarification
16.	S4.1.4.1, 1st para	Additional information provided for clarity in response to RAI 19.1-46C.

	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	**Description of Change**
17.	S4.1.4.2	Rewritten for clarification with additional information provided
18.	S4.1.4.3	Rewritten for clarification with additional information provided
19.	S4.1.5	Rewritten for clarification with additional information provided
20.	S4.1.8	Rewritten for clarification with additional information provided
21.	S4.1.9.1	Change of table numbering.
22.	S4.1.9.2	Rewritten for clarification
23.	S4.1.9.3	Rewritten for clarification with additional information provided
24.	S4.1.9.4	Rewritten for clarification with additional information provided
25.	S4.1.11, Title	Rewritten for consistency with titling scheme.
26.	S4.1.11	Rewritten for clarification with additional information provided
27.	S4.1.1.	Deletion of Reference.
28.	T4.1-1	Additional information provided for clarity
29.	T4.1-2a & b	Additional information provided for clarity
30.	T4.1-3	Additional information provided for clarity
31.	T4.1-4	Revised Table of common cause failures to reflect models used.
32.	T4.1-5	Revised Table of Human Actions to reflect models used.
33.	T4.1-6	Revised Table of System Top Events to reflect models used.
34.	T4.1-7	Revised Table of Basic Events to reflect models used.
35.	T4.1-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
36.	F4.1-2	Additional fault tree added for clarity
37.	S.4.2.2	Rewritten for clarification with additional information provided
38.	S.4.2.3	Rewritten for clarification with additional information provided
39.	S4.2.3.1	Rewritten for clarification with additional information provided
40.	S4.2.3.2,	Rewritten for clarity

	Location (e.g., subsection with paragraph/sentence/item , table with column/row, or figure)	**Description of Change**
41.	S4.2.4.1	Rewritten for clarification with additional information provided.
42.	S4.2.4.2	Additional information provided for clarity in response to RAI 19.1-47 (B)
43.	S4.2.4.3	Additional information provided for clarity in response to RAI 19.1-47 (B)
44.	S4.2.5, 1st& 3rd para	Rewritten for clarification with additional information provided.
45.	S4.2.9.1	Rewritten for clarification with additional information provided.
46.	S4.2.9.4	Additional information provided for clarity.
47.	S4.2.11	Rewritten for clarification with additional information provided.
48.	T4.2-2a	Added table to reflect no system dependencies for ICS.
49.	T4.2-2b	Added transfer gates for ICS.
50.	T4.2-3 5	Additional information in “Type” column to provide for clarity.
51.	T4.2-5	Additional information provided for clarity to exhibit Common Cause Failures in response to RAI 19.1-47 (D, E, F).
52.	T4.2-6	Replaced table to reflect updated top events.
53.	T4.2-7	Replaced table to reflect updated basic events.
54.	T4.2-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
55.	F4.2-1 & 4.2-2	Additional information provided for clarity
56.	F4.2-3	Additional Fault Trees provided for clarity.
57.	S4.3.2	Rewritten for clarification with additional information provided.
58.	S4.3.3.1	Additional information provided for clarity for response to RAI 19.1-48(F).
59.	S4.3.3.2	Rewritten for clarification with additional information provided in response to RAI 19.1-48 (H).
60.	S4.3.3.3	Rewritten for clarification with additional information provided.
61.	S4.3.4.1	Rewritten for clarification with additional information provided.
62.	S4.3.4.2	Rewritten for clarification with additional information provided.
63.	S4.3.4.3	Added section for consistency and added additional information.

	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	**Description of Change**
64.	S4.3.5	Rewritten for clarification with additional information provided.
65.	S4.3.6	Rewritten for clarification with additional information provided.
66.	S4.3.7	Rewritten for clarification with additional information provided.
67.	S4.3.8	Rewritten for clarification with additional information provided.
68.	S4.3.9	Rewritten for clarification with additional information provided.
69.	S4.3.9.1	Rewritten for clarification with additional information provided.
70.	S4.3.9.2	Rewritten for clarification with additional information provided.
71.	S4.3.9.3	Rewritten for clarification with additional information provided.
72.	S4.3.9.4	Rewritten for clarification with additional information provided.
73.	S4.3.10	Rewritten for clarification with additional information provided.
74.	T4.3-1	Rewritten for clarification with additional information provided.
75.	T4.3-2a	Additional information provided for clarity in response RAI.1-48 (D).
76.	T4.3-2b	Additional information provided for clarity.
77.	T4.3-3	Additional information provided for clarity.
78.	T4.3-4	Additional information provided for clarity.
79.	T4.3-5	Rewritten for clarification with additional information provided.
80.	T4.3-6	Additional information provided for clarity.
81.	T4.3-7	Additional information provided for clarity.
82.	T4.3-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
83.	F4.3-1	Additional information provided for clarity
84.	F4.3-2	Additional Fault Trees provided for clarity.
85.	S4.4.3	Rewritten for clarification with additional information provided.
86.	S4.4.3.1	Rewritten for clarification with additional information provided.
87.	S4.4.3.2	Rewritten for clarification with additional information provided.

	Location (e.g., subsection with paragraph/sentence/item , table with column/row, or figure)	**Description of Change**
88.	S4.4.3.3	Rewritten for clarification with additional information provided.
89.	S4.4.4.2	Rewritten for clarification with additional information provided.
90.	S4.4.4.1	Rewritten for clarification with additional information provided.
91.	S4.4.5	Rewritten for clarification with additional information provided.
92.	S4.4.6	Rewritten for clarification with additional information provided in response to RAI 19.1-49(J).
93.	S4.4.7	Deletion of information in response to RAI 19.1-49 (C).
94.	S4.4.8	Rewritten for clarification with additional information provided.
95.	S4.4.9	Rewritten for clarification with additional information provided.
96.	S4.4.9.1	Rewritten for clarification with additional information provided.
97.	S4.4.9.2	Rewritten for clarification with additional information provided
98.	S4.4.9.3	Rewritten for clarification with additional information provided
99.	S4.4.9.4	Deletion of information no longer needed.
100.	S4.4.11,	Rewritten for clarification with additional information provided.
101.	T4.4-1	Rewritten to reflect new fault tree model.
102.	T4.4-2a	Rewritten to reflect new fault tree model.
103.	T4.4-2b	Rewritten to reflect new fault tree model.
104.	T4.4-3	Updated to include new requirements in response to RAI 19.1-49 (J) and (D)
105.	T4.4-4	Additional information to reflect new fault tree model in response to RAI 19.1-49(I) and RAI 19.1-49 (G).
106.	T4.4-5	Updated with current listing of Common Cause Failures including Squib Valves and Check Valves.
107.	T4.4-6	Additional information to reflect new fault tree model.
108.	T4.4-7	Additional information to reflect new fault tree model.
109.	T4.4-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.

	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	**Description of Change**
110.	F4.4-1	Additional information provided for clarification.
111.	F4.4-2	Updated to reflect new fault tree model in response to RAI 19.1-49 (F) & (H).
112.	S4.5.1	Additional information provided for clarification.
113.	S4.5.2	Rewritten with additional information provided for clarification.
114.	S4.5.3	Additional information provided for clarification.
115.	S4.5.3.1	Rewritten with additional information provided for clarification.
116.	S4.5.3.2	Additional information provided for clarification.
117.	S4.5.3.3	Rewritten with additional information provided for clarification.
118.	S4.5.4.1	Additional information provided for clarification.
119.	S4.5.4.2	Additional information provided for clarification.
120.	S4.5.4.3	Additional information provided for clarification.
121.	S4.5.6	Additional information provided for clarification.
122.	S4.5.9	Additional information provided for clarification.
123.	S4.5.9.1	Additional information provided for clarification.
124.	S4.5.9.2	Additional information provided for clarification.
125.	S4.5.9.3	Additional information provided for clarification.
126.	S4.5.9.4	Additional information provided for clarification.
127.	S4.5.11	Rewritten with additional information provided for clarification.
128.	T4.5-2a	Rewritten with additional technical information provided for clarification.
129.	T4.5-2b	Additional technical information provided for clarification.
130.	T4.5-4, through T4.5-7	Additional technical information provided for clarification.
131.	T4.5-8	Additional information provided for clarity in response to RAI 19.1-43
132.	F4.5-1 & 4.5-2	Delete simplified diagram figures replaced with typical I&C logic.
133.	F4.5-3	Additional fault trees added for clarity.

	Location (e.g., subsection with paragraph/sentence/item , table with column/row, or figure)	**Description of Change**
134.	S4.6.2	All of the "Design Assumptions" are no longer assumptions, they are supported by the DCD in Response to RAI 19.1-50 (A) (B) (H).
135.	S4.6.2, Item 1	Added assumption concerning uncertainty associated with check valves in injection path and description of how this is dealt with in the model in response to RAI 19.1-50 (F).
136.	S4.6.2, Item 2	Discussions with the Design Engineer indicated there would be sufficient difference between the injection and equalization squib valves to minimize the potential for common cause failure; this is not stated in the current revision to the DCD so an assumption is made until such time as it is determined to be fact.
137.	S4.6.3	Replaced size "150 mm" with functional "injection. Added criterion on GDCS pool as a result of MAAP runs indicating it is necessary for success. Added alternative success criterion
138.	S4.6.3.1	Deleted reference to design assumptions as they are now fact, not assumptions.
139.	S4.6.3.1, 2nd para	Deleted details not necessary for this discussion: "one 200 mm (8-inch) nominal diameter" and "150 mm (6-inch)".
140.	S4.6.3.1, 3rd para	Deleted discussion on deluge as it is beyond the scope of this analysis: "A thermally actuated deluge valve (Valves F009 on Figure 4.6-1) is connected to each of the four GDCS 200 mm (8-inch) downcomer lines in order to provide a means to flood the lower drywell cavity in the event of a core melt sequence which causes failure of the lower vessel head and allows the molten debris to reach the cavity floor."
141.	S4.6.3.2, 1st para	Deleted details not necessary for this discussion: "150-second timers"
142.	S4.6.3.2	Deleted Success Criteria discussion from System Operation section as it provides more detail than is necessary with respect to System Operation.
143.	S4.6.3.3	Deleted "The GDCS pools are located within the drywell at an elevation significantly above the top of the active core. The suppression pool water level is a few feet above the active core." It provided redundant component location information and information outside the scope of component location.
144.	S4.6.3.2	Deleted "The manual actuation circuit has four channels, one for each division. On the actuation circuitry for Type 2 valves (SP equalizing line valves), 30-minutes time delay logic is replicated to reproduce the sequence of the automatic actuation." This information is either redundant to the following discussion or beyond the detail level necessary to describe this mode of actuation
145.	S4.6.4	Deleted manual actuation discussion because it is either redundant to the following discussion or beyond the detail level necessary to describe this mode of actuation.

	Location (e.g., subsection with paragraph/sentence/item , table with column/row, or figure)	**Description of Change**
146.	S4.6.4.2	Deleted "Deluge squibs to flood drywell are interlocked with high-high Drywell pressure." Deluge is beyond the scope of this document/discussion and the Level 1 model.
147.	S4.6.4, 5th para, 4th sent	Deleted - this information is either redundant to the following discussion or beyond the detail level necessary to describe this mode of actuation.
148.	S4.6.4, 6th para	Deleted "B' from Table designation as it was incorrect to revised format.
149.	S4.6.5	Replaced "interfaces with two support systems and shares components with the RPV water level instrumentation and the other systems using the suppression pool.
150.	S4.6.6, 1st para	The design of the check valve has been altered such that this discussion is no longer valid.
151.	S4.6.6, 2nd para	Editorial change for clarity.
152.	S4.6.8, 1st bulleted item	Deleted "Orifices in injection and equalizing lines" as there are none in response to RAI 19.1-50 (H).
153.	S4.6.8, 3rd bulleted item	Deleted "SP suction line strainers" and added "Check valves."
154.	S4.6.8, 5th and 6th paras	Deleted - This information is neither accurate nor relevant.
155.	S4.6.9	Deleted verbiage as it serves no useful purpose.
156.	S4.6.9.1, 1st and 2nd paras	Editorial changes.
157.	S4.6.9.1, Bulleted items	Changes to reflect changes in success criteria.
158.	S4.6.8.1, Last para	Deleted redundant statement.
159.	S4.6.9.2	Assumptions now listed in section 4.6.2; Rewritten for clarity
160.	S4.6.9.2	Deleted due to format change.
161.	S4.6.9.3	Rewritten for clarity.
162.	S4.6.9.4	Added "Special Events" to be consistent with format; however, there are no special events in this system.
163.	S4.6.10	Deleted verbiage that added no value.
164.	S4.6.11	Updated section name and intent.
165.	S4.6.12	All references to be contained in Section 4.20 of this document.
166.	T4.6-1A	Deleted this table; assumption made concerning different type squib valves on injection and equalization lines; table adds no value.

	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	**Description of Change**
167.	T4.6-1B	Table, without alpha designation, consistent with format; 4.6-1A deleted. Table 4.6-1b is now Table 4.6-1.
168.	T4.6-2a	Updated system dependencies to reflect changes to design.
169.	T4.6-3	Updated to indicate no one-line maintenance to be performed in response to RAI 19.1-50 (E).
170.	T4.6.4	Test and Maintenance combined into one table and this table moved in position; therefore, this table number Updated to prevent empty space. Editorial change
171.	T4.6-2b	New table added, format change.
172.	T4.6-3	Test and Maintenance combined into one table; therefore, this table number was updated to prevent empty space.
173.	T4.6-4	Added new table in response to RAI 19.1-50 (G).
174.	T4.6-7	Additional information provided for clarity in response
175.	T4.6-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
176.	F4.6-1	Replaced simplified drawing with updated drawing.
177.	F4.6-2	Fault Trees to reflect the model update.
178.	S4.7	Title change to reflect new section on Fire Protection found in section 4.16
179.	S4.7.1, Last para	Changes to reflect new section for FPS (it was previously part of this section)
180.	S4.7.2, Assumptions	Assumption section updated entirely. Assumptions #5 &6 are in response to RAI 19.1-52 (A) Assumption 11 is part of response to RAI 19.1-52 (C) Assumption 10 is part of response to RAI 19.1-52 (E)
181.	S4.7.3.1	Hardware Configuration section updated based on extensive design changes in system. Changes include adding parallel valves/lines for suppression pool suction, LPI injection, and suppression pool return lines.
182.	S4.7.3.2	System Operation section updated to add detail and make editorial changes
183.	S4.7.4	Automatic and Manual Control section updated entirely to clarify system actuation (both automatic and manual).
184.	S4.7.5	System Interfaces section changed based on updated design.

	Location (e.g., subsection with paragraph/sentence/item , table with column/row, or figure)	**Description of Change**
185.	S4.7.6 System Testing	System Testing section updated to clarify treatment and in response to RAI 19.1-52 (E)
186.	S4.7.7 System Maintenance	Change due to maintenance events being added to the model. Assumption is made in previous section with regard to testing intervals. Section update should provide details related to RAI # 19.1-52 (E).
187.	S4.7.9.1, bulleted item	Top Event Definitions changed due to Event Tree changes in top logic naming scheme.
188.	S4.7.9.2, 2nd para	Fault Tree Descriptions changed to explain modeling philosophy of system
189.	S4.7.11	PRA Insights section updated to give detail of quantification results
190.	T4.7-1a	Table updated to reflect change in valve type (ACV to NMO)
191.	T4.7-2a	Table updated based on design changes and to add relevant dependencies
192.	T4.7-2b	Table updated to add relevant dependencies
193.	T4.7-3	Table updated to list maintenance events added to logic and assumed testing intervals. Table provides response to RAI # 19.1-52 (D)&(E).
194.	T4.7-4	CCF table updated to reflect extensive changes in CCF treatment for FAPCS
195.	T4.7-6	Table added to show top logic and success criteria associated with each top.
196.	T4.7-7	Table updated to reflect model/basic event changes. Line in table also provides response to RAI # 19.1-52 (F)
197.	T4.7-8b	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
198.	F4.7-1a	Simplified diagram redone due to extensive system design changes from previous revision
199.	F4.7-1b	Simplified diagram redone due to component (RCCWS) id changes from previous revision
200.	F4.7-2	Fault tree figure updated to reflect current model
201.	T4.7-8	Additional information provided for clarity in response to RAI 19.1-43
202.	S4.8.1 bulleted items	Rewritten in response to RAI 19.1-53(A)
203.	S4.8.2	Additional information provided for clarity in response to RAI 19.1-53 (C).
204.	S4.8.3.1	Rewritten for clarity with additional information provided.

	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	**Description of Change**
205.	S4.8.3.2	In Response to RAI 19.1-53(A), updated section to clarify that RWCU/SDC is used for decay heat.
206.	S4.8.4	Rewritten for clarity with additional information provided.
207.	S4.8.4.1	Section rewritten for consistency with standard PRA format.
208.	S4.8.4.2	Section rewritten for consistency with standard PRA format.
209.	S4.8.4.3	Section rewritten for consistency with standard PRA format.
210.	S4.8.5, 1st para 2nd sent	Added sentence to refer to new table for system transfers.
211.	S4.8.5, 2nd para	Updated to show that the containment isolation valves outside containment use instrument air.
212.	S4.8.6	Section replaced to clarify assumption on system testing.
213.	S4.8.7	Subsection replaced because maintenance unavailability has been added to the model.
214.	S4.8.8	Rewritten for clarity with additional information provided in response to RAI 19.1-53 (D).
215.	S4.8.9.1	Rewritten for clarity with additional information provided
216.	S4.8.9.2	Additional information provided
217.	S4.8.9.3	Additional information provided to explain why human interactions have been included in the RWCU/SDCS model
218.	S4.8.9.4	Additional subsection to identify special events used in the latest revision of the model
219.	S4.8.10	Additional information provided for clarity.
220.	S4.8.11, 1st para	Updated to show why human interactions are expected to be a dominant contributor to system failure.
221.	T4.8-1	Revised table to accurately show the most recent design information available.
222.	T4.8-2a	Revised table to show most recent model information. In response to RAI 19.1-53 (G). Flow control valves were added.
223.	T4.8-2b	Added new table to provide information on system transfers, which have been modeled.

	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	**Description of Change**
224.	T4.8-3	In response to RAI 19.1-53(F), Updated because maintenance valves (manual valves) are no longer included in the model explicitly. Added row to clarify that components that are not active on a quarterly basis are expected to be tested every two (2) years. Combined Testing Table and Maintenance Table into one table. Added new basic events for testing and maintenance that have been added to the model.
225.	T4.8-3 Notes	In further response to RAI 19.1-53 (F), added source of failure probabilities for unavailability due to maintenance or testing. Also, in response to RAI 19.1-53 (E).
226.	T4.8-4	In response to RAI 19.1-53 (D), table has been replaced with common cause events reflective consistent with the current model.
227.	T4.8-5, Title	Table number Updated consistent with the numbering scheme.
228.	T4.8-5	Added restoration errors to table because restoration errors are human error events
229.	T4.8-6	Table revised to show most recent model information.
230.	T4.8-7	In response to RAI 19.1-53(B), updated table to show basic events used in the current model.
231.	T4.8-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
232.	F4.8-1	Revised to be consistent with current model.
233.	F4.8-2, Sheets 1-89	Revision to be consistent with current model.
234.	S4.9.1 Title	Changed to reflect new titling scheme.
235.	S4.9.1	Rewritten for clarification with additional information provided.
236.	S4.9.2	Additional information provided in response to RAI 19.1-54(A), updated to reflect current model.
237.	S4.9.3.1	Revision to reflect current system fault tree modeling assumptions.
238.	S4.9.3.2, 5th para	Revision for consistency with current design information.
239.	S4.9.4.1	Revision for consistency with current design information.
240.	S4.9.4.2	Additional information provided for clarity .
241.	S4.9.4.3	Revision for consistency.
242.	S4.9.5,	Rewritten for clarification with additional information provided.

	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	**Description of Change**
243.	S4.9.6	Rewritten for clarification with additional information provided.
244.	S4.9.7	Rewritten for clarification with additional information provided.
245.	S4.9.8	Rewritten for clarification with additional information provided.
246.	S4.9.9.1	Rewritten for clarification with additional information provided.
247.	S4.9.9.2	Rewritten for clarification with additional information provided.
248.	S4.9.9.3	Rewritten for clarification with additional information provided.
249.	S4.9.9.4	Rewritten for clarification with additional information provided.
250.	S4.9.10	Rewritten for clarification with additional information provided.
251.	S4.9.11	Rewritten for clarification with additional information provided.
252.	T4.9-1 thru 4.9-7	Additional information provided for clarity and in response to RAI 19.1-54 (B) (C) (D).
253.	T4.9-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
254.	F4.9-1 thru 4.9-6	Replaced for clarification with additional information provided.
255.	S4.10.1 Title	Changed to reflect new titling scheme.
256.	S4.10.1	Rewritten for clarification with additional information provided.
257.	S4.10.2	Additional information provided in response to RAI 9.1-55 (A), RAI 19.1-55 (B), RAI 19.1-55 (E).
258.	S4.10.2, Items 1 through 13	Additional information provided for clarity.
259.	S4.10.3.1	Rewritten for clarification with additional information provided.
260.	S4.10.3.2	Rewritten for clarification with additional information provided.
261.	S4.10.4	Rewritten for clarification with additional information provided.
262.	S4.10.4.1	Section added with information for clarification.
263.	S4.10.4.2	Section added with information for clarification.
264.	S4.10.4.3	Section added with information for clarification.

	Location (e.g., subsection with paragraph/sentence/item , table with column/row, or figure)	**Description of Change**
265.	S4.10.5	Sentence added for reference.
266.	S4.10.6	Rewritten for clarification with additional information provided and in response to RAI 19.1-55 (F).
267.	S4.10.7	Rewritten for clarification with additional information provided.
268.	S4.10.9	Section deleted.
269.	S4.10.9.1	Rewritten for clarification with additional information provided.
270.	S4.10.9.2	Changed to reflect new titling scheme.
271.	S4.10.9.3	Rewritten for clarification with additional information provided.
272.	S4.10.9.4	Section added with information for clarification.
273.	S4.10.10	Rewritten for clarification with additional information provided.
274.	S4.10.11	Changed to reflect new titling scheme.
275.	S4.10.11	Rewritten for clarification with additional information provided.
276.	T4.10-1	Rewritten for clarification with technical information for clarity.
277.	T4.10-2a, & 2b	Table added for technical clarification.
278.	T4.10-3 through T4.10-8	Tables added for technical clarification.
279.	F4.10-1	In response to RAI 19.1-55 (G).
280.	F4.10-2	Additional information for technical clarification.
281.	T4.10-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
282.	S4.11.1	Rewritten for clarification with additional information provided.
283.	S4.11.2 title	Changed to reflect new titling scheme.
284.	S4.11.2, items 1through 7	Rewritten for clarification with technical information for clarity. In response to RAI 19.1-56 (B), RAI 19.1-56 (A)
285.	S4.11.3.1	Rewritten for clarification with additional information provided.
286.	S4.11.3.2	Rewritten for clarification with additional information provided.
287.	S4.11.4	Rewritten for clarification with additional information provided.

	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	**Description of Change**
288.	S4.11.4.1	Section added with additional information provided.
289.	S4.11.4.2	Section added with additional information provided.
290.	S4.11.4.2	Section added with additional information provided.
291.	S4.11.4.3	Section added with additional information provided.
292.	S4.11.5	Rewritten for clarification with additional information provided.
293.	S4.11.7	Rewritten for clarification with additional information provided.
294.	S4.11.8	Rewritten for clarification with additional information provided.
295.	S4.11.9.1	Section added with additional information provided.
296.	S4.11.9.2	Section added with additional information provided.
297.	S4.11.9.3	Rewritten for clarification with additional information provided.
298.	S4.11.9.1	Section deleted.
299.	S4.11.9.2	Section deleted.
300.	S4.11.9.3	Section deleted.
301.	S4.11.10	Rewritten for clarification with additional information provided.
302.	S4.11.11	Rewritten for clarification with additional information provided.
303.	T4.11-1	Additional information provided for technical clarification.
304.	T4.11-2a	Additional information provided for technical clarification.
305.	T4.11-2b	Additional information provided for technical clarification.
306.	T4.11-3	Additional information provided for technical clarification also, in response to RAI 19.1-56 (C).
307.	T4.11-4	Additional information provided also, in response to RAI 19.1-56 (D)
308.	T4.11-5	Additional information provided for technical clarification.
309.	T4.11-6	Additional information provided for technical clarification.
310.	T4.11-7	Additional information provided for technical clarification.

	Location (e.g., subsection with paragraph/sentence/item , table with column/row, or figure)	**Description of Change**
311.	T4.11-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
312.	F4.11-1 through 4.11-2	Added figures for additional technical clarification.
313.	S4.12 Title	Title Updated to match description sequence. This section also addresses RAI 19.1-57 comments.
314.	S4.12.1, 1st para, 1st & 2nd lines	Rewritten for clarity .
315.	S4.12.1, 1st para, last line	Rewritten for clarity.
316.	S4.12.2 Title	Title Updated for consistency.
317.	S4.12.2	Added assumptions.
318.	S4.12.3.1, 1st, 2nd and 3rd paras	Editorial changes because generic test and maintenance data is used on this model.
319.	S4.12.3.2	Rewritten for clarity.
320.	S4.12.4.3	Title change for consistency.
321.	S4.12.4.3	Additional information provided for clarification.
322.	S4.12.5, 1st para	Editorial change to include table numbering.
323.	S4.12.5, 2nd para	Editorial change to match systems modeled.
324.	S4.12.6, 3rd and 4th para	Deleted to match modeling.
325.	S4.12.7	Additional information provided for clarification.
326.	S4.12.8	Additional information provided for clarification.
327.	S4.12.9	Additional information provided for clarification.
328.	S4.12.9.3	Additional information provided for clarification.
329.	S4.12.9.4	Editorial change, subsection added.
330.	S4.12.11	Title change for consistency.
331.	S4.12-11	Additional technical information provided for clarity.
332.	S4.12.12	Section deleted.

	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	**Description of Change**
333.	T4.12-1	Technical information added for clarification.
334.	T4.12-2a	Rewritten for clarification.
335.	T4.12-2b	Additional technical information provided for clarity.
336.	T4.12-3	Additional technical information provided for clarity.
337.	T4.12-4 & 5	Editorial change with technical information provided for clarity.
338.	T4.12-6 & 7	Additional technical information provided for clarity.
339.	T4.12-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
340.	S4.13	In response to RAI 19.1-58
341.	S4.13.1	Title change for consistency.
342.	S4.13.2	Title change for consistency.
343.	S4.13.2, items 1-8	Rewritten with additional information provided for clarification.
344.	S14.13.3.1	Additional information provided, in response to RAI 19.1-58.
345.	S14.13.3.2	Additional information provided for clarification.
346.	S14.13.4.1	Rewritten with additional information provided for clarification.
347.	S4.13.4.3	Title change for consistency and additional information provided for clarification.
348.	S4.13.5	Additional information provided.
349.	S4.13.6	Additional information provided in response to RAI 19.1-58 (E).
350.	S4.13.7 thru 4.13.9	Rewritten for clarity.
351.	S4.13.9	In response to RAI 9.1-58 (F) (G).
352.	S4.13.9.1	Additional information provided for clarification.
353.	S4.13.9.2	Rewritten with additional information provided for clarification.
354.	S4.13.9.3	Rewritten with additional information provided for clarification.
355.	S4.13.11	Title change for consistency.

	Location (e.g., subsection with paragraph/sentence/item , table with column/row, or figure)	**Description of Change**
356.	S4.13.12	Section deleted. No replacement.
357.	T4.13-1	Rewritten with technical information.
358.	T4.13-2a	Technical information provided
359.	T4.13-2b	New technical information proved.
360.	T4-13-3	Rewritten with additional technical information provided.
361.	T4-13-4 through 7	Rewritten with technical information provided.
362.	T4.13-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
363.	F4.13-1 – F4.13-2	Additional technical information provided for technical clarification.
364.	S4.14 Title	Editorial change for consistency with new titling scheme.
365.	F4.14-1 through F4.14-3	Additional technical information provided.
366.	S4.14.1, Title	Editorial change for consistency with new titling scheme.
367.	S4.14.1, paras 1, 2 and 3	Updated to reflect the DCD Rev. 3 design.
368.	S4.14.1	In response to RAI 19.1-59(A): Statement is deleted for clarification. Refer to 4.13.4 for details. The isolation power centers supply AC power from nonsafety-related system to safety-related loads. Clarification has been documented in DCD Rev. 3 Section 8.1.5.2.1 (last paragraph on page 8.1-4).
369.	S4.14.1	In response to RAI 19.1-59(C): This paragraph has been deleted since the Instrument & Control Power Supply System is not credited in Rev. 2 PRA model.
370.	S4.14.2, Items (2) – (24)	Rewritten with new PRA model assumptions.
371.	S4.14.3.1, 1st para	Rewritten for clarity.
372.	S4.14.3.1, 3rd para	Rewritten for clarity .
373.	S4.14.3.1, 3rd and 4th bulleted items	Rewritten with DCD Rev 3 Chapter 8 figures (one-line diagrams).
374.	S4.14.3.1	Paragraph deleted for clarification.
375.	S4.14.3.1, 4th para	Deleted to reflect DCD Rev. 3 design.
376.	S4.14.3.1, 5th para	Change in response to RAI 19.1-59(B). PRA takes no credit for such plug-in connections.

	Location (e.g., subsection with paragraph/sentence/item , table with column/row, or figure)	**Description of Change**
377.	S4.14.3.1, 6th para	Changed to reflect DCD Rev. 3 design.
378.	S4.14.3.1, 7th para	In response to RAI 19.1-59(C) Paragraph deleted to reflect DCD Rev. 3 design. The Instrument and Control Power Supply System is not credited in Rev 2 PRA model.
379.	S4.14.3.1, 8th para	Changed to reflect DCD Rev. 3 design.
380.	S4.14.3.2, 1st para	Changed to reflect DCD Rev 3 design.
381.	S4.14.3.2, 2nd para	Changed to reflect DCD Rev 3 design.
382.	S4.14.3.2, 3rd para	Changed to reflect DCD Rev 3 design.
383.	S4.14.3.3, 3rd para	Rewritten for clarity.
384.	S4.14.4	Changed to reflect DCD Rev. 3 design.
385.	S4.14.4.1	New section added for consistency of standard formatting.
386.	S4.14.4.2	New section added for consistency of standard formatting.
387.	S4.14.4.3	New section added for consistency of standard formatting.
388.	S4.14.5	Changed to reflect DCD Rev. 3 design.
389.	S4.14.8	Rewritten with PRA Rev. 2 CCF model.
390.	S4.14.9.1	Rewritten to reflect the PRA Rev. 2 models.
391.	S4.14.9.2	Rewritten to reflect the PRA Rev. 2 models.
392.	S4.14.9.3	Rewritten to reflect the PRA Rev. 2 models.
393.	S4.14.9.4	New section added for consistency of standard formatting.
394.	S4.14.11	New section added for consistency of standard formatting.
395.	T4.14-1	Diesel generator alarms and indications are updated according to DCD Rev. 3
396.	T4.14-1	R10, R11, R12, The basic instrumentation and control requirements are updated.
397.	T4.14-2a	Updated per standard format. Updated with the Rev. 2 PRA model which is consistent with DCD Rev. 3.
398.	T4.14-2b	New table added to show the transfer gates.

	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	**Description of Change**
399.	T4.14-3	Updated per standard format.
400.	T4.14-3	In response to RAI 19-1.59(E): The estimate for the 230kV switchyard test & maintenance event is calculated with the 116 hours per EPRI URD generic maintenance duration with no operability limit (Table A2-3 on page A.A-27).
401.	T4.14-4	In response to RAI 19-1.59(D): CCF events have been updated with new models. The RCCWS CCF Events are removed from this section.
402.	T4.14-5	Human errors are modeled for DGs.
403.	T4.14-6	Rewritten with new system top events.
404.	T4.14-7	Rewritten with Rev. 2 PRA model basic events.
405.	T4.14-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
406.	F4.14-1	Figures are updated with the DCD Rev. 3 figures on AC power system design.
407.	F4.14-2 and 3	Figures added for Diesel Generator supporting system simplified diagrams
408.	F4.14-4 through 7	Moved from Appendix 4.B and updated with Rev. 2 AC power system fault trees.
409.	T4.15.1 title	Title Updated due to revised styling scheme.
410.	T4.15.1, 1st para, 1st sent.	Added the acronym for the UPS system.
411.	S4.15.2 Title	Title change to reflect the revised styling scheme.
412.	S4.15.2, 2nd & 3rd items	Added to reflect the new model assumptions.
413.	S4.15.3.1, 2nd para	Rewritten to reflect the current UPS system design.
414.	S4.15.3.1, 3rd para	Rewritten to reflect the current UPS system design. The change addresses RAI 19.1-60(b)
415.	S4.15.3.1, 4th para	This statement is deleted since the modularized UPS is not credited in the PRA Rev. 2 model. This change addresses RAI 19.1-60(c)
416.	S4.15.3.2, 3rd para	Deleted to reflect the current UPS system design.
417.	S4.15.3.3, Title	Rewritten due to the updated standard format.
418.	S4.15.3.3, 1st para	Rewritten to be consistent with the acronym definition.

	Location (e.g., subsection with paragraph/sentence/item , table with column/row, or figure)	**Description of Change**
419.	S4.15.3.3, 2nd para	Rewritten for clarity.
420.	S4.15.5, 1st para, 1st sent	Updated to be consistent with the acronym definition.
421.	S4.15.5, 1st para 2nd sent	Deleted to reflect the current UPS system design.
422.	S4.15.6, 1st para	Rewritten for clarity.
423.	S4.15.7, 2nd para	Rewritten for clarity.
424.	S4.15.8	Rewritten due to the updated standard format.
425.	S4.15.8, 1st para	Common Cause Failures (CCF) are modeled according to the Section 5.3 guidance with few exceptions that are justified.
426.	S4.15.9.1, 2nd para	Updated to be consistent with the new UPS system model.
427.	S4.15.9.1, 2nd bulleted item	Updated to be consistent with the new UPS system model.
428.	S4.15.9.1, 1st para	Rewritten for clarity.
429.	S4.15.9.1, 4th bulleted item	Updated to be consistent with the new UPS system model.
430.	S4.15.9.2	Updated to be consistent with the new UPS system model.
431.	S4.15.9.4	Updated to be consistent with the new UPS system model.
432.	S4.15.11	Added new section for PRA insights.
433.	S4.15.12	References are moved to section 4.20.
434.	T4.15-1	Editorial changes.
435.	T4.15-2a	System dependency matrix tables are updated to reflect the current UPS system design.
436.	T4.15-2b	Added the transfer gate table for more information.
437.	T4.15-3	Rewritten due to the revised styling scheme.
438.	T4.15-4	Updated to reflect modeled CCF events. The CCF table is Updated to T4.15-4 due to new styling scheme.
439.	T4.15-6	Table 4.15-5 is Updated to be the table for modeled human error events per new styling scheme.
440.	T4.15-7	Basic event table has been updated in Table 4.15-7. This change addresses RAI 19.1-60(a)

	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	**Description of Change**
441.	T4.15-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
442.	F5.15-1	Updated to reflect the DCD Rev 3 design change.
443.	F4.15-2	All fault trees have been updated to be consistent with system design.
444.	S4.16	This subsection was previously blank and is being updated in response to RAI 19.1-51
445.	T4.16-8	Additional information provided for clarity in response to RAI 19.1-43
446.	S4.17.1 Title	Editorial change for consistency with new titling scheme.
447.	S.4.17.1, 1st and 2nd para	Updated to reflect the new DCD Rev. 3 design.
448.	S.4.17.2	Rewritten with the standard format.
449.	S.4.17.2	Deleted since the plug-in power source is not credited.
450.	S4.17.2, Item (3)	Change in response to RAI 19.1-61(A). The battery room ventilation is not required per new design in DCD Rev 3.
451.	S4.17.2 Item (4)	Added assumption.
452.	S4.17.2, Item (5)	Added assumption.
453.	S4.17.3.1, 1st para	Rewritten for clarification
454.	S4.17.3.1, 2nd para	Rewritten to reflect the new DCD Rev. 3 design.
455.	S4.17.3.1, 3rd para	Rewritten for clarity
456.	S4.17.3.3 Title	Rewritten for clarity
457.	S4.17.3.3, 1st para	Rewritten for clarity
458.	S4.17.3.3, 3rd para	Rewritten to reflect the design change in DCD Rev 3.
459.	S4.17.5, 2nd para	Rewritten to reflect the design change in DCD Rev 3.
460.	S4.17.5	A paragraph has been deleted in response to RAI 19.1-61(B).
461.	S4.17.5, 3rd para	Added a new transfer gate table for clarification.
462.	S4.17.6, 1st para	Rewritten to reflect the standard format.
463.	S4.17.8	Updated to reflect new CCF model.

	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	**Description of Change**
464.	S4.17.9.1, 1st para	Rewritten for clarity.
465.	S4.17.9.1, 2nd para	Rewritten for clarity.
466.	S4.17.9.1, 3rd para	Added new discussion on system top events
467.	S4.17.91, 4th para	Rewritten per standard format.
468.	S4.17.9. 1st para	Rewritten for clarity.
469.	S4.17.9.2, 2nd para	Rewritten for clarity.
470.	S4.17.11	Rewritten to reflect format consistency.
471.	S4.17.12	Rewritten per standard styling.
472.	T4.17-2a	Rewritten per standard styling format.
473.	T4.17-2b	Table added to reflect new transfer gates.
474.	T4.17-3	Editorial changes.
475.	T4.17-4	Updated with new Rev. 2 system model.
476.	T4.17-5	Rewritten for clarity.
477.	T4.17-6	Additional information provided to Table 4.17-6.
478.	T4.17-7	Additional information provided to System Basic Events
479.	T4.17-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
480.	F4.17-1	Updated with DCD Rev 3 figure
481.	F4.17-2	Rewritten with new system model fault trees.
482.	S4.18	Rewritten for consistency with new titling scheme.
483.	S4.18.1	Rewritten for clarification with additional information provided.
484.	S4.18.1 Item (7)	In response to RAI 19.1-66G.
485.	S4.18.2	Editorial change for consistency with new titling scheme.
486.	S4.18.2, Items 1 thru 6	Rewritten with additional information added for clarification
487.	S4.18.2 Item 7	In response to RAI 19.1-66G.

	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	**Description of Change**
488.	S4.18.2 Item 8	In response to RAI 19.1-66H
489.	S4.18.3.1, 3rd para	In response to RAI 19.1-66A
490.	S4.18.3.1, 7th para	In response to RAI 19.1-66C
491.	S4.18.3.1 8th para	In response to RAI 19.1-66C.
492.	S4.18.3.2, 3rd para	In response to RAI 19.0.0-07 for clarification.
493.	S4.18.4	Information located in Table 4.18-1.
494.	S4.18.4.1	New section added.
495.	S4.18.4.2	New section added.
496.	S4.18.4.3	New section added.
497.	S4.18.6	Rewritten with additional information added for clarification.
498.	S4.18.8	Additional information added for clarification.
499.	S4.18.9	Additional information added for clarification.
500.	S4.18.9.1	Rewritten with new top gate information.
501.	S4.18.9.2	Editorial change for consistency with new titling scheme.
502.	S4.18.9.2	Section replaced with fault tree.
503.	S4.18.9.3	Rewritten with additional information provided for clarification.
504.	S4.18.9.4	New section added.
505.	S4.18.11	Rewritten for consistency with new titling scheme.
506.	S4.18.11	Rewritten with additional information provided for clarification.
507.	S4.18.12	Section deleted. No replacement.
508.	T4.18-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
509.	T4.18-1	Technical detail deleted, no longer needed.
510.	T4.18-2a	Rewritten with additional technical information provided.
511.	T4.18-2b - T4.18-8	New tables added for technical clarification.

	Location (e.g., subsection with paragraph/sentence/item , table with column/row, or figure)	**Description of Change**
512.	F4.18-2	Figures added for additional technical clarification.
513.	S.4.19.1, 1st para 2nd line	This is a new component in accordance with a design change. Replaced entire section.
514.	S4.19.2	Assumptions replaced
515.	S4.19.3	System Description updated
516.	S4.19.3.1, 1st subsection	Rewritten to reflect updated design
517.	S4.19.3.1, 2nd subsection	Technical change to include both inner and outer pools
518.	S4.19.3.2	Rewritten to be consistent with new thermal-hydraulic analysis
519.	S4.19.3.2	Updated system operation section in response to RAI 19.1-67 (D)
520.	S4.19.3.3	Technical change to display a new feature in the PRA
521.	S4.19.4	Added reference to Table 4.19-1.
522.	S4.19.4.1 S4.19.4.2 S4.19.4.3	Added sections on actuation
523.	S4.19.5	Updated section in response to RAI 19.1-67 C and new TH analysis
524.	S4.19.7	Technical change to show new success criteria. Included response to RAI 19.1-67 A. Added reference to new table.
525.	S4.19.8	Rewrote section based on inlet filters. Added reference to table.
526.	S4.19.9.1	Revamp of top events. Include cross-connect valve function
527.	S4.19.9.3	New section added on human interactions
528.	S4.19.11	New section added on PRA insights
529.	T4.19-1	Added table to reflect instrumentation and alarms
530.	T4.19-2a	New table for system dependencies
531.	T4.19-2b	New table for transfer gates
532.	T4.19-3	New table for test and maintenance
533.	T4.19-4	New table for common cause failures

	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	**Description of Change**
534.	T4.19-5	New table for reflect there are no human errors in the PCCS
535.	T4.19-7	New table for basic events
536.	T4.19-8	New Table of Cutsets from the system quantification in response to RAI 19.1-43.
537.	F4.19-1	Added new simplified diagram of PCCS
538.	F4.19-2	Added schematic of ICS/PCCS pools and interconnections
539.	F4.19-3	Added new fault trees
540.	S4.20	Rewritten reference to reflect chapter content.