

Tier 2 Chapter 8 Revision 2 to Revision 3 Change List

Item	Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure)	Description of Change
1	Abbreviations and Acronyms List	Added “UAT, Unit Auxiliary Transformer.”
2	Abbreviations and Acronyms List	Changed the Abbreviation for “Transformer” from “XMFR” to “XFMR.”
3	S8.1.1	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
4	S8.1.1, 2 ND para.	The beginning of the paragraph was revised to read, “Power is supplied to the plant from two independent offsite power sources, the “Normal Preferred” power source and the “Alternate Preferred” power source. The loss of both preferred sources may be referred to as a Loss of Preferred Power (LOPP) or a Loss of Offsite Power (LOOP). The terms may be used interchangeably.” This addition is meant to clarify the meaning of the terms LOPP and LOOP, as used throughout Chapter 8.
5	S8.1.1, 3 RD para., 3 RD sentence	Changed the phrasing “two or more onsite independent nonsafety-related standby diesel generators” to just “two onsite independent nonsafety-related standby diesel generators.” The ESBWR standard plant will utilize only two nonsafety-related diesels.
6	S8.1.2	As an editorial change, the heading for Subsection 8.1.2 was changed to “Utility Power Grid and Offsite Power System Descriptions.”
7	S8.1.2.2, 2 ND para.	Revised to read, “The system includes the plant switchyard and the high voltage tie lines to the main generator circuit breaker, the high-side motor operated disconnects (MODs) of the unit auxiliary transformers (UATs), and the high-side MODs of the reserve auxiliary transformers (RATs).” This change reflects a high voltage main generator circuit breaker as well as a high voltage feed to the UATs.

8	S8.1.2.2, 3 RD para., 2 ND sentence	Added input terminals of the UAT, RAT, and generator circuit breaker MODs as an ending point of the offsite power system. This change reflects a high voltage main generator circuit breaker, high voltage MODs on the high side of the UATs, and MODs on the high side of the RATs.
9	S8.1.2.2, 7 TH para., 2 ND sentence	Changed the phrase “through the main transformers to the UATs” to “to the UATs.” This reflects the UATs being fed from the high side of the main transformers. Also, clarified “offsite power source” to “normal preferred power source.”
10	S8.1.3.1, 1 ST para., 1 ST sentence	In listing the components of the onsite AC power system, moved the generator breaker from before to after the main transformers. This reflects the high voltage main generator circuit breaker. Also, added a high-side MOD for the generator breaker.
11	S8.1.3.1, 1 ST para., 1 ST sentence	Changed “UAT input breakers” to “UAT input MODs and circuit breakers.”
12	S8.1.3.1, 5 TH para., 1 ST sentence	Clarified “Both load groups of the PIP A and PIP B” to “Both PIP A and PIP B buses.”
13	S8.1.3.1, 6 th para	Deleted 6 th paragraph. Reason, redundant to S8.1.3.2, 3 rd and 4 th paragraphs.
14	S8.1.3.2	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
15	S8.1.3.2, 1 ST para., 1 ST sentence	Modified the statement to include the DC/AC inverters and inverter loads as part of the onsite DC power system rather than exclude them. This change is consistent with the commitment made in T8.1-1 Note 7. Also, this change is in response to RAI 8.1-19.
16	S8.1.3.2, 2 ND para., 2 ND sentence	Changed “Non-Essential Distributed Control and Information System (NE-DCIS)” to “NonSafety-related Distributed Control and Information System.”
17	S8.1.3.2, 3 RD para., 1 ST sentence	Changed “Essential Distributed Control and Information System (E-DCIS)” to “Safety-related Distributed Control and Information System.”
18	S8.1.4, 3 rd sentence	Revised reference to 7.4 and deleted the incorrect reference to S7.1.1.2. This is an editorial change.
19	S8.1.5.1, 1 ST para., 1 ST	Changed “Unit-specific portions of the offsite power

	sentence	system” to “The offsite power system.” This is an editorial change meant as clarification.
20	S8.1.5.1, 3 RD para., 1 ST sentence	Re-written to state that the switchyard will minimize simultaneous failure from the switchyard to “the main generator circuit breaker, UATs, and RATs.” This change reflects the generator breaker and UAT feed being located on the high side of the main transformers.
21	S.8.1.5.1, old 4 TH para	Paragraph was moved to 8.1.5.2, new 2 ND paragraph. The three single-phase main step-up transformers and spare transformer are part of the onsite power system, as shown in Figure 8.1-1 Sheet 1.
22	S8.1.5.1, new 4 TH para.	Re-written to state “A single tie line connects the plant main generator circuit breaker MOD and UAT MODs to the switchyard and constitutes the plant’s normal offsite power circuit.” This change reflects the high voltage generator breaker and UAT MODs.
23	S.8.1.5.1, old 7 TH para	Paragraph was moved to 8.1.5.2, new 3 RD paragraph. The unit auxiliary transformers are part of the onsite power system, as shown in Figure 8.1-1 Sheet 1.
24	S.8.1.5.1, old 8 TH para	Paragraph was moved to 8.1.5.2, new 4 TH paragraph. The reserve auxiliary transformers are part of the onsite power system, as shown in Figure 8.1-1 Sheet 1.
25	S8.1.5.2.1	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
26	S8.1.5.2.1, 1 ST para.	Deleted the sentence stating “UAT circuit breakers are provided to isolate each UAT during its maximum fault without causing a trip of the Main Generator Circuit Breaker or the isolation of the second UAT.” This change reflects the change to high voltage UAT MODs rather than medium voltage UAT breakers.
27	S8.1.5.2.1, 1 ST para.	Moved the last sentence describing transfer from UATs to RATs to the end of the new 4 TH paragraph in 8.1.5.2.1. Also, changed the fast-transfer to an auto-transfer.
28	S8.1.5.2.1, new 6 TH para., item (1)	Reworded to describe that the UATs are connected to the main generator through the main transformer and directly to the main offsite power circuit. This change reflects a high voltage UAT feed and high voltage UAT MODs.

29	S8.1.5.2.1, new 8 TH para.	Deleted the sentence “The Class 1E AC distribution system ends at the terminals of the Class 1E loads.” This is an editorial change, as the unnecessary description did not provide any useful information.
30	S8.1.5.2.1, new 8 TH para.	Changed “since safety-related batteries will supply the required power during an emergency” to “since safety-related batteries will supply the required power during loss of AC power.” This is an editorial change meant as clarification.
31	S8.1.5.2.1, new 8 TH para.	In describing Isolation Power Center protection and isolation, replace “devices” with “breakers and transformers as shown on Figure 8.1-1 Sheets 2 and 3.” This is an editorial change meant as clarification.
32	S8.1.5.2.1, new 8 TH para.	Re-word the last sentence of the paragraph to read, “The battery chargers and AC power supplied through rectifiers prevent degradation of the safety-related DC power system by the nonsafety-related AC power system through their output diodes as shown in Figure 8.1-3.” This is an editorial change.
33	S8.1.5.2.1, new 9 TH para., 2 ND sentence	Change “design basis event” to “design basis accident.” Design Basis Accident (DBA) is the term listed in the “Abbreviations and Acronyms List.”
34	S8.1.5.2.1, new 13 TH para., 2 ND sentence	Clarified the statement that safety-related power and controls systems conform to Seismic Category I requirements and are housed in Seismic Category I structures, adding “with the exception of the four feedwater pump safety-related isolation breakers in the Seismic Category II turbine building, as shown in Figure 8.1-1.”
35	S8.1.5.2.1, new 14 TH para., 1 ST sentence	Added “in accordance with GDC 18” as clarification on the capability for periodic testing of safety-related equipment and systems.
36	S8.1.5.2.2	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
37	S8.1.5.2.2.1	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-

		related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
38	S8.1.5.2.2.1, 2 ND para.	Changed “backed up by its own 480 VAC Isolation Power Center” to “backed up by its divisional 480 VAC Isolation Power Center.”
39	S8.1.5.2.2.1, 3 RD para., 2 ND sentence	As clarification, revised to state “Provision is made for automatic switching to the alternate bypass supply, 480 VAC to 120 VAC transformer, from its division in case of a failure of the UPS inverter power supply.”
40	S8.1.5.2.2.1, 3 RD para., 3 RD sentence	Replaced “inverter normal AC power supply” with “UPS normal AC power from the inverter.”
41	S8.1.5.2.2.1, 3 RD para., 4 TH sentence	Removed the statement, “The Class 1E uninterruptible AC power supply system complies with IEEE Standard 944 (Figure 8.1-4).” IEEE Standard 944 has been withdrawn by the IEEE. This change is in response to RAI 8.1-9.
42	S8.1.5.2.2.2	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
43	S8.1.5.2.2.2, 3 RD para.	Removed the statement, “The non-Class 1E uninterruptible power supply complies with IEEE Standard 944 (Reference 8.1-1).” IEEE Standard 944 has been withdrawn by the IEEE. This change is in response to RAI 8.1-9.
44	S8.1.5.2.3	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
45	S8.1.5.2.4, “General Design Criteria,” 4 TH bullet	Appended the discussion of GDC 17, “Electric Power Systems,” with the statement “However, the ESBWR standard design complies with GDC 17 with respect to two independent and separate offsite power sources and onsite power sources.”
46	S8.1.5.2.4, “General Design Criteria,” 5 TH	Appended the discussion of GDC 18, “Inspection and Testing of Electrical Power Systems,” with the statement

	bullet	“However, the nonsafety-related offsite and onsite AC systems that supply AC power to the Isolation Power Centers are testable.”
47	S8.1.5.2.4, “NRC Regulatory Guides,” 1 ST bullet	Appended the discussion of RG 1.6, “Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems,” with the statement “The ESBWR offsite and onsite nonsafety-related power sources do comply with independence and redundancy between their sources and distribution systems.”
48	S8.1.5.2.4, “NRC Regulatory Guides,” 3 RD bullet	Added the statement “IEEE 1188, not IEEE 450, is applicable to VRLA batteries” to the discussion on RG 1.32.
49	S8.1.5.2.4, “NRC Regulatory Guides,” 11 TH bullet	Appended the discussion of RG 1.128, “Installation Design and Installation of Large Lead Storage Batteries for Nuclear Power Plants,” with the statement “The ESBWR Valve Regulated Lead Acid (VRLA) batteries will limit the release of hydrogen to less than 1% while battery room temperature is within specified vendor limits during charging evolutions. IEEE 344, IEEE 323, and IEEE 1187 apply to VRLA batteries. IEEE 484 is not applicable for VRLA batteries.”
50	S8.1.5.2.4, “NRC Regulatory Guides,” 12 TH bullet	Appended the discussion of RG 1.129, “Maintenance, Testing, and Replacement of Large Lead Storage Batteries for Nuclear Power Plants,” to state that periodic testing, maintenance, and replacement of batteries will be in accordance with IEEE 1188. This change is made to reflect VRLA batteries. Also, added the statement “IEEE 450 is not applicable for VRLA batteries.” In response to RAI 8.3-53, the VRLA batteries are the only electrical equipment not previously used in U.S. nuclear plants.
51	S8.1.5.2.4, “NRC Regulatory Guides,” 16 TH bullet	Added Regulatory Guide 1.204 to ensure that lightning protection is covered.
52	S8.1.5.2.4, “Branch Technical Positions,” 3 RD bullet	Deleted “for COL information.” Revised note to read, “See Subsection 8.2.4.9.”
53	S8.1.5.2.4, “Branch Technical Positions,” 6 TH bullet	Appended the discussion of BTP PSB 1, “Adequacy of Station Electric Distribution System Voltages,” with the statement “The 480VAC Isolation Power Centers do have degraded voltage protection. See Subsection 8.3.1.1.2.”
54	S8.1.7	Deleted 8.1.7, “COL Unit-Specific Information,” and 8.1.7.1, “Utility Power Grid Description.” The utility power grid description is addressed in Section 8.2.1.2.1.

		No COL action is required for this item.
55	S8.1.7, 1 ST reference	Removed IEEE Standard 944, “IEEE Application and Testing of Uninterruptible Power Supplies for Power Generating Stations.” Standard has been withdrawn by IEEE. This change is in response to RAI 8.1-9.
56	S8.1.7, 1 ST new reference	Added 10 CFR 50 Appendix A, “General Design Criteria for Nuclear Power Plants.” This change is in response to RAI 8.1-10.
57	T8.1-1, 4 TH row	For GDC 17, added applicability to Offsite Power System and AC (Onsite) Power System, is consistent with the discussion of GDC 17 under 8.1.5.2.4 for applicability.
58	T8.1-1, 5 TH row	For GDC 18, added applicability to Offsite Power System and AC (Onsite) Power System, is consistent with the discussion of GDC 18 under 8.1.5.2.4 for applicability.
59	T8.1-1, 11 TH row	For RG 1.6, deleted reference to Note 3. Also, added applicability to Offsite Power System, AC (Onsite) Power System, and DC (Onsite) Power System, is consistent with the discussion of RG 1.6 under 8.1.5.2.4 for applicability.
60	T8.1-1, 13 TH row	For RG 1.32, deleted reference to Note 3. Listed IEEE 1188. Also, added applicability to Offsite Power System.
61	T8.1-1, 22 ND row	For RG 1.128, deleted IEEE 484 and listed IEEE Standards 485, 344, 323, and 1187. This change reflects VRLA batteries.
62	T8.1-1, 23 RD row	For RG 1.129, deleted IEEE 450 and listed IEEE Standard 1188. This change reflects VRLA batteries.
63	T8.1-1, 27 TH row	Added Regulatory Guide 1.204, with applicability to Offsite Power System and AC (Onsite) Power System. Listed associated IEEE Standards 665, 666, 1050, and C62.23.
64	T8.1-1, 33 RD row	For BTP PSB 1, added applicability to AC (Onsite) Power System, as the 480VAC Isolation Power Centers do have degraded voltage protection. See Subsection 8.3.1.1.2
65	T8.1-1, note (3)	There is no change in the existing note. The nonsafety-related PIP diesel generators will be addressed per the Maintenance Rule. This comment addresses RAI 8.1-16.
66	T8.1-1, note (4)	Deleted Note 4 and all references to Note 4 in Table 8.1-1. COLA items are addressed in their respective subsections.
67	T8.1-1, note (7)	Modified Note 7 to read, “The safety-related UPS system and the safety-related 480VAC Isolation Power Centers are

		included in the DC onsite applicability column.”
68	T8.1-2	Deleted Table 8.1-2, “Grid Design Parameters.” The utility power grid is addressed in Section 8.2.1.1.
69	F8.1-1, F8.1-2, F8.1-3, F8.1-4, F8.1-5, F8.1-6	Updated figures to reflect current design bases and delete unnecessary details, to be specified during detailed design. This includes the move of the main generator circuit breaker back to the high voltage side of the main transformers. This change addresses RAI 8.1-15.
70	S8.2.1.1	Added the following description of the transmission system: “The transmission lines provide electric power from the utility grid to the offsite power system. The lines are designed and located to minimize the likelihood of failure and ensure grid reliability. See Subsection 8.2.4.1 and S8.2.4.10 for transmission system protocol.”
71	S8.2.1.2, 2 ND para., 1 ST sentence	Changed “Normal Preferred” power source supply to UATs from “through the main transformers” to “through motor operated disconnects and isolation circuit breakers.” This reflects a high voltage UAT feed.
72	S8.2.1.2, 2 ND para., 2 ND sentence	Deleted the description of a medium voltage main generator circuit breaker and UAT feed. The main generator circuit breaker and UAT feed (through MODs) will now be high voltage.
73	S8.2.1.2, 2 ND para., 3 RD sentence	Deleted the statement, “The Normal Preferred power source serves the total plant load consisting of nonsafety-related loads, plant investment protection (PIP) nonsafety-related loads, and safety-related loads.” This description already appears in Section 8.1, and the statement did not add any additional information.
74	S8.2.1.2, 2 ND para., 4 TH sentence	Changed Normal Preferred Power interface with Offsite Power System from “high voltage terminals of the main transformers” to “high voltage terminals of the main generator circuit breaker MOD and UAT MODs.” This change reflects the high voltage main generator circuit breaker and UAT feed.
75	S8.2.1.2, 2 ND para., 5 TH sentence	Added the statement, “The MOD feeding a faulted UAT will auto-open after the UAT high voltage breaker opens.”
76	S8.2.1.2, 3 RD para., 4 TH sentence	Deleted the statement, “The voltage and frequency at the high side of the RATs are site specific with the actual values to be determined in the COL application.” Subsection 8.2.4.4, the COL item “Alternate Preferred Power” upholds this requirement.
77	S8.2.1.2, 4 TH , 5 TH , 6 TH ,	This discussion of main power transformers, UATs, RATs,

	7 TH , 8 TH , and 9 TH paragraphs	and main generator circuit breaker is related to the onsite power systems and was thus moved to Section 8.3. These six paragraphs are now the first six paragraphs of Subsection 8.3.1.1.
78	S8.2.1.2, 10 TH para.	Added the clarification that unit synchronization is normally through the <i>onsite</i> main generator circuit breaker. Also, modified the last sentence to read, “Dual trip coils and redundant protective relaying schemes are provided for both the main generator circuit breaker and the normal preferred supply breakers.”
79	S8.2.1.2, 11 TH , 12 TH , 13 TH , 14 TH , 15 TH , and 16 TH paragraphs	These discussions of onsite isolated phase bus duct, non-segregated phase bus duct, disconnect links, and MODs are related to the onsite power systems and were thus moved to Section 8.3. These six paragraphs are now the seventh through twelfth paragraphs of Subsection 8.3.1.1.
80	S8.2.1.2.1, 1 ST para.	Deleted Subsection 8.1.5.1 from the list of places switchyard design bases are contained. The switchyard design basis is contained primarily in Subsection 8.2.3.
81	S8.2.1.2.1, 2 ND para.	For clarification, changed “all relay schemes” to “Protective relay schemes.”
82	S8.2.1.2.1, 5 TH para., 1 ST sentence	The statement regarding two redundant AC power supply systems to switching station auxiliary loads was re-written to read, “Two redundant plant investment protection (PIP) AC power supply systems supply AC power to the switching station's auxiliary loads as shown in Figure 8.1-1 Sheets 2 and 3.” This is an editorial change meant as clarification.
83	S8.2.1.2.1, 6 TH para.	Changed “The site switchyard will be described in the COL application” to “The switchyard design is site specific. See Subsection 8.2.4.2.” This is an editorial change, and allows the reference to the COL item.
84	S8.2.2	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
85	S8.2.2	Added the Subsection 8.2.2.1, “Reliability and Stability Analysis.” Stated that this is site specific and referenced the COL item located at 8.2.4.9. Also, placed the original content of S8.2.2 under the new Subsection 8.2.2.2,

		“Regulatory Analysis.”
86	S8.2.2, “Applicable Criteria,” 2 ND bullet	Revision 2 addressed the 72-hour time limit and addresses part of RAI 8.1-18 (reference 8.3.2.1.1 for the remainder of the RAI response).
87	S8.2.2, “Applicable Criteria,” 2 ND bullet	Appended the discussion of GDC 17, “Electric Power Systems,” with the statement “However, the ESBWR standard design does comply with GDC 17 with respect to two independent and separate offsite power sources and standby onsite power sources.” This change is consistent with the clarification given in Subsection 8.1.5.2.4.
88	S8.2.2, “Applicable Criteria,” 3 RD bullet	Appended the discussion of GDC 18, “Inspection and Testing of Electrical Power Systems,” with the statement “However, the nonsafety-related offsite and onsite AC systems that supply AC power to the Isolation Power Centers are testable.” This change is consistent with the clarification given in Subsection 8.1.5.2.4 and addresses RAI 8.2-12 and RAI 8.3-51.
89	S8.2.2, “Applicable Criteria,” 5 TH bullet	Changed the discussion of RG 1.32 from stating that the RG was not applicable to the ESBWR offsite power system to stating that the RG is applicable. This change is consistent with the commitment made in Table 8.1-1.
90	S8.2.2, “Applicable Criteria,” 7 TH bullet	As an editorial change, revised the discussion of BTP ICSB 11 to read, “This topic is site specific and addressed in Subsection 8.2.2.1.”
91	S8.2.3, 2 ND bullet, 3 RD sentence	Revised the statement regarding both the normal preferred and alternate preferred power circuits sharing a common switchyard to read, “Both circuits may share a common switchyard but adequate separation exists.” The term “may” was added, as the sharing of a common switchyard could be site specific.
92	S8.2.3, 4 TH bullet	Deleted this bullet, which stated that main transformers, UATs, and RATs meet the requirements of IEEE C57.12.00. This information is related to the onsite power systems, and has now been incorporated into Subsection 8.3.1.1, new 5 TH paragraph.
93	S8.2.3, 6 TH bullet	This bullet, regarding three hour fire barriers between RATs, UATs, and main transformers, is information related to onsite power systems and was thus moved to 8.3.3.3, new 2 ND paragraph. This is an editorial change.
94	S8.2.3, new 7 TH bullet	Added “Interface protocols shall be established between the control room and the transmission operator, in accordance with the interconnection service agreement.” This addition

		is in response to RAI 8.2-5, Response to Letter #65.
95	S8.2.4.1	Deleted Table 8.1-2 from the discussion of where the transmission system will be addressed. Table 8.1-2 has been deleted. Re-stated that, “The COL applicant will describe the transmission system in Subsection 8.2.1.1.”
96	S8.2.4.2	Changed the wording of this COL item to read, “The COL applicant will describe the switchyard in Subsection 8.2.1.2.1.” This wording is consistent with other COL items.
97	S8.2.4.3	The COL item “Normal Preferred Power” was changed from “This COL item is addressed in Subsection 8.2.1.2.” to “The COL applicant will specify the normal preferred power voltage in Subsection 8.2.1.2.”
98	S8.2.4.4	The COL item “Alternate Preferred Power” was changed from “This COL item is addressed in Subsection 8.2.1.2.” to “The COL applicant will specify the alternate preferred power voltage in Subsection 8.2.1.2.”
99	S8.2.4.5	Deleted the COL item “Unit Synchronization.” The commitment that the switchyard normal preferred power supply breakers are capable of unit synchronization is described in Subsection 8.2.1.2 of the ESBWR standard plant design. This is not a COL item.
100	S8.2.4.6	The COL item “Protective Relaying” was changed from “This COL item is addressed in Subsection 8.2.1.2.1.” to “The COL applicant is responsible for switchyard protective relaying and will ensure such relaying is coordinated, reviewed, and accepted by the applicable grid reliability organization.” This change is in response to RAI 8.2-5.
101	S8.2.4.7	Revised to add “and will be described by the COL applicant.” This editorial change affirms that “Switchyard DC Power” requires an action of the COL applicant.
102	S8.2.4.8	Revised to add “and will be described by the COL applicant.” This editorial change affirms that “Switchyard AC Power” requires an action of the COL applicant.
103	S8.2.4.9	The COL item “Switchyard Transformer Protection” was revised from “This COL item is addressed in Subsection 8.2.1.2” to “This COL item will be addressed in Subsection 8.2.1.2.1 by the COL applicant.” This is an editorial change.
104	S8.2.4.10	The COL item “Stability and Reliability of the Offsite Transmission Power Systems” was revised to read, “The

		Reliability and Stability Study, as approved by the applicable grid reliability organization, will be provided in the COL application as a supporting document to the COLA (see Subsection 8.2.2.1).” This change is in accordance with RAI 8.2-5.
105	S8.2.4.11	Deleted the COL item “Generator Circuit Breaker.” The onsite generator circuit breaker meets the requirements of Appendix A to SRP Section 8.2, and is part of the ESBWR standard plant design. No COL action is required.
106	S8.2.4.12	Deleted the COL item “Degraded Voltage.” The degraded voltage protection criteria are described in Subsection 8.3.1.1.2 as part of the ESBWR standard plant design. No COL action is required. This change addresses RAI 8.2-13.
107	S8.2.4.13	The COL item “Interface Requirements” was revised to clarify that the COL applicant is responsible for the interface requirements addressed in Subsection 8.2.3. This addresses RAI 8.2-5 SO1.
108	S8.2.5	Moved Reference 8.2-1, IEEE C57.12.00, to Reference 8.3-33.
109	S8.3.1.1, new 6 th para, 2 nd sentence.	Replaced IEEE Standard C37.06 with IEEE Standards C37.013 and C37.010 to reference correct high voltage breaker standards as an editorial clarification.
110	S8.3.1.1, new 7 TH para., 1 ST sentence	Revised to read, “The onsite isolated phase bus duct provides the electrical interconnection between the main generator output terminals and the low voltage terminals of the main transformers.” The iso-phase bus will now only connect from the main generator to the main transformers.
111	S8.3.1.1, new 10 TH para.	Revised to read that UATs are provided with input isolation breakers, MODs, and disconnect links. Also, revised the discussion of transfer from a UAT to an RAT to read, “On loss of power from the UATs, 13.8 kV and 6.9 kV switchgear buses are automatically transferred to the RATs, which are connected to the alternate preferred power source.” This is meant as clarification, as the original wording could be confusing.
112	S8.3.1.1, new 15 TH para., 2 ND sentence	The PG bus switch from the normal preferred power source (UAT) to the alternate preferred power source (RAT) was changed from a fast bus transfer to an auto bus transfer. This change was in response to NRC Information Notice 2006-31, which addressed the inadequate fault interrupting rating of circuit breakers. Bus transfer will be finalized as part of detailed design, when complete load lists are available and appropriate load calculations may be

		performed.
113	S8.3.1.1, new 15 TH para., 3 RD sentence	In describing the PG bus switch on restoration of UAT power, a manually selected fast bus transfer was changed to a manually selected bus transfer. This change addresses RAI 8.3-54 and reflects the “break-before-make” breaker transfer philosophy.
114	S8.3.1.1, new 16 TH para., 3 RD sentence	Changed “in each power load group” to “connected to each PIP bus.” This is an editorial change, as the phrase “each power load group” was not clearly defined.
115	S8.3.1.1, new 16 TH para., 4 TH sentence	The PIP bus switch from the normal preferred power source (UAT) to the alternate preferred power source (RAT) was changed from a fast bus transfer to an auto bus transfer. This change was in response to NRC Information Notice 2006-31, which addressed the inadequate fault interrupting rating of circuit breakers. Bus transfer will be finalized as part of detailed design, when complete load lists are available and appropriate load calculations may be performed.
116	S8.3.1.1, new 16 TH para., 5 TH sentence	In describing the PIP bus switch on restoration of UAT power, a manually selected fast bus transfer was changed to a manually selected bus transfer. This change addresses RAI 8.3-54 and reflects the “break-before-make” breaker transfer philosophy.
117	S8.3.1.1.1	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
118	S8.3.1.1.1, 1 ST para., 3 RD sentence	The ending point for the medium voltage distribution system was changed from the high voltage terminals of the low voltage power center transformers to the low voltage terminals of the low voltage power center transformers. This will include the transformers as part of the medium voltage distribution system, as they contain medium voltage.
119	S8.3.1.1.1, 1 ST para., 5 TH sentence	The statement was revised to include both cables and non-segregated buses interconnecting switchgear buses as part of the medium voltage system.
120	S8.3.1.1.1, 3 RD para., 1 ST sentence	“Four 6.9 kV PIP buses (two for PIP-A and two for PIP-B)” was changed to “Two 6.9 kV PIP buses (PIP-A and PIP-

		B).” See Figure 8.1-1, Sheets 2 and 3.
121	S8.3.1.1.1, 3 RD para., 5 TH sentence	Clarified “paralleling of the two power supplies” to “simultaneous connection of UATs and RATs to the PIP buses.”
122	S8.3.1.1.2	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
123	S8.3.1.1.2, “Isolation Power Centers,” 2 ND paragraph	Changed the IPC safety-related loads to include the safety-related battery chargers, rectifiers, and regulating transformers.
124	S8.3.1.1.2, “Isolation Power Centers,” 3 RD paragraph	Changed “and also in the 6.9 kV PIP buses as a defense in depth feature” to “to prevent tripping of all isolation power center loads, in accordance with BTP PSB1.”
125	S8.3.1.1.2, “Isolation Power Centers,” 4 TH paragraph	Removed 4 TH paragraph under heading “Isolation Power Centers.” The transportable AC generator referenced has been deleted from the ESBWR design. This change is in response to RAI 8.3-4 and part of RAI 8.3-55 (reference 8.3.1.1.7 for remaining RAI response).
126	S8.3.1.1.3	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
127	S8.3.1.1.3, 3 RD para., 3 RD sentence	Changed “non-division” to “nonsafety-related power.” This is an editorial change meant as clarification.
128	S8.3.1.1.3, 3 RD para., 4 TH sentence	The exception that RPS monitoring and reactor feedpump trip circuit breakers are housed in the Seismic Category II Turbine Building was deleted for clarity, as these items were not part of the safety-related UPS system.
129	S8.3.1.1.3, “Safety-Related Uninterruptible AC Power Supply System,” 3 RD para., 2 ND sentence	Added rectifiers to the list of components that can be inspected, serviced, and tested channel by channel without tripping the RPS logic.
130	S8.3.1.1.3, “UPS Components,” new 1 ST	Added “Two solid-state UPS rectifiers, to convert 480 VAC to 250 VDC.” Also, removed the phrase “and 480

	and 2 ND bullets	VAC power” from the new second bullet, which describes the action of the solid-state inverters.
131	S8.3.1.1.3, “UPS Components,” new 3 RD bullet	Revised the new third bullet from “Two solid-state transfer switches to sense inverter failure and automatically switch to alternate isolated non-safety 120VAC power” to “Two solid-state transfer switches to sense inverter failure and automatically switch to safety-related 480/120VAC power.”
132	S8.3.1.1.3, “UPS Components,” new 4 TH bullet	Added rectifier maintenance to the actions permitted by the two manual bypass switches.
133	S8.3.1.1.3, “Nonsafety-Related Uninterruptible Power Supply System,” 1 ST para., 3 RD sentence	Added “solid-state rectifier” to the list of components that is included in each UPS load group.
134	S8.3.1.1.3, “Nonsafety-Related Uninterruptible Power Supply System,” 5 TH para., 3 RD sentence	Changed “emergency power” to “backup DC power” as an editorial change.
135	S8.3.1.1.4	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
136	S8.3.1.1.4, 3 RD para., 2 ND sentence	Changed “Non-Essential Distributed Control and Information System (NE-DCIS)” to “NonSafety-related Distributed Control and Information System.”
137	S8.3.1.1.5	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
138	S8.3.1.1.5, “Physical Separation and Independence,” 5 TH bullet, 1 ST sentence	Deleted MCCs from the list of examples of safety-related electrical equipment. There are no safety-related motor control centers in the ESBWR standard plant design.

139	S8.3.1.1.5, “Physical Separation and Independence,” 9 TH bullet	Deleted the bullet describing treatment of associated cables. Refer to Subsection 8.3.1.3.1 for the ESBWR’s stance on associated cables.
140	S8.3.1.1.5, “Class 1E Electric Equipment Design Bases and Criteria,” 3 RD bullet, 1 ST sentence	Removed motor control centers from the discussion. There are no safety-related MCC’s in the ESBWR standard plant design.
141	S8.3.1.1.5, “Class 1E Electric Equipment Design Bases and Criteria,” 3 RD and new 4 TH bullet	Removed the reference to Subsections 8.3.4.1 and 8.3.4.2. Both subsections have been revised to require no additional COL action. Portions of section 8.3.4.2 wording have been re-located to the new 4 TH bullet.
142	S8.3.1.1.5, “Testing”	Added statement, “Refer to Subsection 8.3.4.2,” the COL item for periodic testing of power and protection systems.
143	S8.3.1.1.6	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
144	S8.3.1.1.6, “Grounding”	Replaced description of medium and low voltage grounding under the “Grounding” heading with “The ESBWR grounding will comply with guidelines provided in Section 8A.1 (IEEE-665 and IEEE-1050).” This change is in response to RAI 8.3-21.
145	S8.3.1.1.6, “Bus Protection,” 1 ST bullet	Added degraded voltage protection to the list of protections on 13.8 kV and 6.9 kV bus incoming circuits. This addition is in response to RAI 8.3-28 S01.
146	S8.3.1.1.6, “Bus Protection,” 5 TH bullet	No change, but Revision 2 already addressed RAI 8.3-50.
147	S8.3.1.1.7, 1 ST paragraph	Replaced the statement “Only loss of preferred power (LOPP) signals are used to trip the loads,” with “Loss of Normal Preferred Power may cause load shedding and sequencing with an auto transfer to Alternate Preferred Power. If Alternate Preferred Power is not sensed by protective relaying, power will be supplied by the appropriate onsite standby diesel power source.” This addition is meant as clarification, as the previous definition of LOPP could be ambiguous. The new statement

		describes a loss of Normal Preferred Power.
148	S8.3.1.1.7, 3 RD paragraph	Deleted the statement, “Details of loads and starting sequences are addressed in Subsection 8.3.4.3.” PIP loads are nonsafety-related and do not require rapid restart to supply either AC or DC loads prior to 72 hours. Loads and sequencing are a nonsafety-related function and thus selected loads will be sequenced as available. This change addresses part of RAI 8.3-55 and answers RAI 8.3-17 SO1 (reference 8.3.1.12 for the remaining RAI response).
149	S8.3.1.1.7, “LOPP,” 1 ST para., 2 ND sentence	The PIP bus switch from the normal preferred power source (UAT) to the alternate preferred power source (RAT) was changed from a fast bus transfer to an auto bus transfer. This change was in response to NRC Information Notice 2006-31, which addressed the inadequate fault interrupting rating of circuit breakers. Bus transfer will be finalized as part of detailed design, when complete load lists are available and appropriate load calculations may be performed.
150	S8.3.1.1.7, “Loss of Coolant Accident (LOCA)”	Revised to state that the onsite diesel generator is not started when a LOCA occurs without a LOPP. The onsite standby diesel generators are not required to provide AC or DC power for safe shut-down.
151	S8.3.1.1.7, “LOPP Following LOCA”	Deleted the statement that the standby diesel generator should be started and running in standby. Per the previous description of LOCA, the onsite standby diesel generators are not required to provide AC or DC power for safe shut-down. They do not start on a LOCA without a LOPP.
152	S8.3.1.1.7, “Loss of Normal Preferred Power Source During Standby Onsite Power Source Paralleling Test”	The first paragraph of the old heading “LOPP During Standby Onsite Power Source Paralleling Test” was clarified for only a loss of Normal Preferred Power.
153	S8.3.1.1.7, “Loss of Alternate Preferred Power Source During Standby Onsite Power Source Paralleling Test”	Revised to clarify loading and testing and clarify/describe protective relaying logic.
154	S8.3.1.1.8, 1 ST para., 1 ST sentence	Clarified that the standby AC power system is not required for any safety-related function or to achieve safe shut-down.

155	S8.3.1.1.8, 2 ND para.	Added statement to refer to Subsections 9.5.4, 9.5.5, 9.5.6, 9.5.7, 9.5.8, and 9.4.7 for additional information on standby AC power source auxiliary systems.
156	S8.3.1.1.8, 4 TH para	In discussion of Figure 8.1-1, clarified “interconnections” between the normal and alternate preferred and standby onsite power sources to “interface.” The sources will never truly “interconnect” but do share a common interface.
157	S8.3.1.1.8, Redundant (Non-Safety) Standby AC Power Supplies.	Deleted words: “auxiliary and” and “only” as editorial clarifications for incorrect descriptions.
158	S8.3.1.1.8, “Ratings and Capability,” 2 ND bullet	Changed “20% voltage drop” to “an unacceptable voltage drop.”
159	S8.3.1.1.8, “Ratings and Capability,” 3 RD bullet	Deleted the discussion related to the standby onsite AC power source starting its largest motor load. There are no large, safety-related inductive loads on the nonsafety-related PIP buses.
160	S8.3.1.1.8, “Ratings and Capability,” 4 TH bullet	Changed the time in which each standby onsite AC power source is capable of being loaded from “within the time shown in Table 8.3-4” to “within an acceptable time that will not challenge the diesel generator capacity.” Table 8.3-4 will be deleted. The nonsafety-related diesel generator does not have the time constraints of active plants or require rapid loading.
161	S8.3.1.1.8, “Ratings and Capability,” 5 TH bullet	Replaced the term “short-term” power rating with “continuous” power rating. This change is in response to RAI 8.3-13.
162	S8.3.1.1.8, “Ratings and Capability,” 6 TH bullet	Deleted the reference to Table 8.3-4, which will be deleted (see above). Also, clarified the phrase “postulated fault conditions,” which was unclear, to “expected transients.”
163	S8.3.1.1.8, “Ratings and Capability,” 7 TH bullet	Deleted this bullet, regarding a backup mechanical-hydraulic portion of the governor. This is a design detail that will be addressed as part of the detailed design. It is dependent upon information from the diesel vendor.
164	S8.3.1.1.8, “Ratings and Capability,” 2 ND para.	Deleted the statement “Refer to Subsection 8.3.4.3 for diesel generator loads and sequencing.” This is no longer a COL item. The nonsafety-related diesel generator loads and sequencing are a standard ESBWR design feature.
165	S8.3.1.1.8, “Starting Circuits and Systems,” 1 ST para.	Removed LOCA from the statement of events that will automatically state the standby onsite AC power sources. This change reflects the new description of a LOCA

		without a LOPP in 8.3.1.1.7.
166	S8.3.1.1.8, “Automatic Shedding, Loading, and Isolation”	Deleted the statements, “Under this condition, major loads are tripped from the 6.9 kV PIP bus, except for the diesel auxiliary 480V power center feeders, before closing the standby onsite AC power source breaker. The large motor loads are then re-applied sequentially and automatically to the bus after closing of the standby onsite AC power source breaker.” This is redundant discussion that was already addressed in Subsection 8.3.1.1.7 and gives no new information.
167	S8.3.1.1.8, “Protection Systems,” 2 ND para.	Changed title to add, “for Diesel Generators” as clarification. Added additional alarms from Table 8.3-1 that will result in an onsite standby generator shut down and a generator breaker trip.
168	S8.3.1.1.8, “Local and Remote Control”	Changed the transfer of control to a local control station from “by operating key switches in the Main Control Room” to “by operator action.” The exact method is detailed design.
169	S8.3.1.1.8, “Interlocks and Testability”	Clarified the term “test mode” to “parallel loading.”
170	S8.3.1.1.8, “Interlocks and Testability”	Deleted “and LOCA” from the discussion of parallel operation testing interlocks, as described in Subsection 8.3.1.1.7.
171	S8.3.1.2.1	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
172	S8.3.1.2.1, “GDC 17, Electric Power Systems”	Appended the discussion of GDC 17, “Electric Power Systems,” with the statement “However, the ESBWR standard design does comply with GDC 17 with respect to two independent and separate offsite power sources and standby onsite power sources.” This change is consistent with the clarification given in Subsection 8.1.5.2.4.
173	S8.3.1.2.1, “GDC 18, Inspection and Testing of Electric Power systems”, first paragraph	Added last sentence from GDC 18, S8.1.5.2.4, for consistency with ESBWR compliance to the GDC, as an editorial clarification.

174	S8.3.1.2.1, “GDC 18, Inspection and Testing of Electric Power Systems”	As clarification in the statement precluding the bulleted items describing inspection and testing of the safety-related power system, added “(including safety-related UPS and Isolation Power Centers). As per Note 7 of Table 8.1-1, the safety-related UPS systems and the safety-related 480VAC Isolation Power Centers are included in the DC onsite power system.
175	S8.3.1.2.1, “GDC 18, Inspection and Testing of Electric Power Systems”, 1 ST bullet and third bullet.	Revised to “During divisional equipment shutdown occurring during plant operation...” This is an editorial change. Third bullet: Revised last ‘is’ to “are able to be” as an editorial clarification which will not impose a testing schedule.
176	S8.3.1.2.3	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
177	S8.3.1.2.3, 2 ND sentence	Revised to clarify that all safety-related equipment “in a harsh environment” is qualified to IEEE 323.
178	S8.3.1.3.1	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
179	S8.3.1.3.1, 1 ST para.	Replaced “For associated cables (if any) treated as safety-related, there will be an identification criterion to identify them as associated cables and to which division they are associated. The identification criterion will allow associated circuits to be differentiated from safety-related circuits” with “The ESBWR standard plant design will eliminate safety-related associated circuits as defined by IEEE 384 and in accordance with RG 1.75.”
180	S8.3.1.3.1, 1 ST para.	Deleted the statement at the end of the paragraph, “Refer to Subsection 8.3.4.6.” The COL item “Associated Circuits” previously located at 8.3.4.6 has been deleted.
181	S8.3.1.3.1, “Equipment Identification,” 2 ND	Removed motor control centers and switchgear as examples and replaced with “power centers.” There are no safety-

	bullet	related MCC's in the ESBWR standard plant design.
182	S8.3.1.4.1	As an editorial change when referring to systems or equipment comprising those systems, many instances of "Class 1E" and "non-Class 1E" are changed to "safety-related" and "nonsafety-related," respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
183	S8.3.1.4.1, 4 TH para.	Deleted GDC 18 from the list of standards with which the physical independence of electric power systems complies. GDC 18 is only related to the inspection and testing of such systems.
184	S8.3.1.4.1, "Cable derating and cable tray fill," 2 ND sentence	Deleted the sentence, "Electric cables of a discrete safety-related electric system division are installed in a cable tray system provided for the same division." This information was redundant and is duplicated just above. All safety-related load cables are 120 VAC and originate from each division of safety-related 120 VAC distribution panels which answers RAI 8.3-23 SO1. As earlier described, the DC safety-related voltage only goes to the inverters and never enters a raceway.
185	S8.3.1.4.1, "Cable routing in potentially harsh environmental areas"	Revised "and other protective means described within this section (conduit and armored cable)" to "by conduit and armored cable and by qualifications described in Subsection 8.3.3.2." RAI 8.3-24 SO1 is answered in 8.3.1.4.1.
186	S8.3.1.4.1, "Sharing of cable trays"	Revised the statement to read, "Each division of safety-related AC and DC system cables is provided with its own independent and separate raceway system."
187	S8.3.1.4.1, "Cable and raceway marking"	Revised first sentence to read, "All cables are tagged..." and deleted the exception to lighting and communication cables since all cables will be tagged.
188	S8.3.1.4.1, "Spacing of wiring and components in control boards, panels, and relay racks," 1 ST para., 1 ST sentence and second para., second sentence	Removed the qualification, "if, from a plant operational point of view, this is feasible." Also, changed "operational design" to "human factors engineering." Second Paragraph, deleted, "by approved isolators (generally optical)", as an editorial clarification.
189	S8.3.1.4.1, "Electric penetration assembly"	Revised this sub-heading to "Primary containment electrical penetration assemblies."
190	S8.3.1.4.1, "Electric	Deleted, "Refer to Subsection 8.3.4.7 for fault current

	penetration assembly,” 2 ND para., 3 RD sentence	devices and curves.” This COL item has been deleted, and will be part of the ESBWR detailed design.
191	S8.3.1.4.1, “Control of Compliance with Separation Criteria During Design and Installation,” 1 ST para.	Deleted the first paragraph, with listed procedures addressing the responsibility of independent and redundant systems. This editorial comment deletes redundant information is found in other, more appropriate, chapters.
192	S8.3.1.4.1, “Control of Compliance with Separation Criteria During Design and Installation,” 2 ND para., 3 RD sentence	Changed “manufacturer’s drawings” to “detailed design drawings.”
193	S8.3.1.4.1, “Control of Compliance with Separation Criteria During Design and Installation,” 2 ND para., 4 TH sentence	In discussing separation of nonsafety-related equipment to enhance power generation reliability, added “and availability.” Deleted “although such separation is not a safety consideration.” This is an editorial change. Nonsafety-related equipment implies that separation of such equipment is not a safety-related consideration.
194	S8.3.1.4.1, “General,” 2 ND para., 1 ST sentence	Revised the statement to read, “Independence of mutually redundant and/or diverse safety-related equipment, devices, and cables is achieved by spacial separation, barriers and electrical isolation.”
195	S8.3.1.4.1, “General,” 2 ND para., 2 ND sentence	Revised the statement to read, “This protection is provided to maintain the independence of safety-related circuits and equipment so that the protective function required during and following a design basis event including a single fire anywhere in the plant or a single active failure in any circuit or equipment with one division out of service can be accomplished with the remaining two divisions.”
196	S8.3.1.4.1, “General,” 2 ND para., 3 RD sentence	Deleted the reference to Appendix 9A.6. The mention of this Appendix has been moved to Subsection 8.3.3 for fire protection.
197	S8.3.1.4.1, “Control, Relay, and Instrument Panels/Racks,” item (1), 1 ST sentence	Revised to read, “Human factors engineering may require certain operator interface control panels to have human factors considerations that dictate that redundant protection system or safety-related system circuits or devices be located in a single panel.”
198	S8.3.1.4.1, “Isolation Devices”	RAI 8.3-32 SO1 is answered by the clarification between safety-related and nonsafety-related cables in this description that states that all cables retain their divisional identification. This means that the nonsafety-related fiber cables will also have their color code that is different from

		safety-related cable.
199	S8.3.1.4.1, “Reactor Protection (Trip) System (RPS),” item (3), 1 ST sentence	Deleted “same and only” as an editorial change in describing running wiring within the same division.
200	S8.3.1.4.1, “Reactor Protection (Trip) System (RPS),” item (6)	Deleted the statement, “The scram group conduits are not routed within the confines of any other raceway.” Separation has already been adequately defined, and this sentence offered no new information.
201	S8.3.1.4.1, “Reactor Protection (Trip) System (RPS),” item (7)	Deleted the statement, “Any one scram group conduit may also be routed along with scram group conduits of any of the three other scram groups as long as the minimum separation distance of 2.5 cm (1 in.) is maintained.” This has already been stated in item (6), and thus was redundant and offered no new information.
202	S8.3.1.4.1, “Other Safety-Related Systems,” item (5)a.	As clarification, changed “The conduits for ADS solenoid A are divisionally separated from other ADS solenoid B conduits and contain no other cable” to “The conduits for ADS solenoids are divisionally separated from other ADS solenoid conduits and contain no other cable.
203	S8.3.1.4.1, “Other Safety-Related Systems,” item (9)	As editorial clarification, item (9) was re-worded to read, “Inputs from safety-related equipment or circuits are safety-related and retain their divisional identification up through their isolation device. The output circuit from this isolation device supports a nonsafety-related function.”
204	S8.3.4.1, “Other Safety-Related Systems,” item (10)	Deleted item (10), which described nonsafety-related equipment and inputs. This section deals only with safety-related systems.
205	S8.3.2.1	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
206	S8.3.2.1, 4 TH para.	Deleted reference to Subsection 8.3.4.8. “DC Voltage Analysis” has been deleted as a COL item and is addressed in the ESBWR standard plant design.
207	S8.3.2.1.1	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-

		related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
208	S8.3.2.1.1, “250V Safety-Related DC Systems Configuration,” 1 ST para., 2 ND sentence	Revised “Each set supplies power to selected safety loads for at least 72 hours following a licensing basis event without load shedding” to read “Each set supplies power to the safety-related inverters for at least 72 hours following a design basis event.”
209	S8.3.2.1.1, “250V Safety-Related DC Systems Configuration,” 1 ST para., 6 TH sentence	Corrected to state that the main DC distribution bus feeds only the UPS inverter for safety-related DC systems. Also, revised “to equalize the battery charging” to “to act as a backup to either of the batteries.” RAI 8.3-39 SO1 is answered with this change, no loads other than the inverters are on the safety-related batteries and their respective chargers.
210	S8.3.2.1.1, “Safety-Related Batteries,” 1 ST para., 1 ST sentence	Clarified the rating of the safety-related batteries from “rated for 72-hour station blackout conditions” to “rated to exceed 72-hour station blackout conditions.” The batteries will be sized so as to not fall below their minimum discharge voltage until after 72 hours. This change addresses part of RAI 8.1-18 and RAI 8.1-2 SO1. (reference 8.2.2 for the remainder of the RAI response).
211	S8.3.2.1.1, “Safety-Related Batteries,” 1 ST para., 2 ND sentence	Revised the DC system minimum battery terminal voltage at the end of the discharge period from “210 volts” to “210 volts (1.75 volts per cell).” This is based on information from the battery vendor. This satisfies RAI 8.3-35 SO1.
212	S8.3.2.1.1, “Safety-Related Batteries,” 1 ST para., 3 RD sentence	Changed reference to “280 Volts” to “282 VDC (2.35 volts per cell) as specified by the battery vendor and allowed by the voltage rating of the connected loads (inverters).” This change is in response to RAI 8.3-36 and answers RAI 8.3-39 SO1, “each inverter is the only battery load”.
213	S8.3.2.1.1, “Safety-Related Batteries,” 1 ST para., 4 TH sentence	Added, “The UPS inverters are designed to supply 120VAC power with DC input less than the minimum discharge voltage (210 VDC) and greater than the maximum equalizing charge voltage (282 VDC) specified by the battery vendor.” This change is in response to RAI 8.3-36 SO1.
214	S8.3.2.1.1, “Safety-Related Batteries,” 2 ND para., 2 ND sentence	In the statement that each distribution circuit is capable of transmitting sufficient energy to start and operate all required loads in that circuit, deleted “start and.” There are no inductive loads started by the safety-related batteries.
215	S8.3.2.1.1, “Safety-Related Batteries,” 2 ND para.	Deleted reference to 80% of the battery ampere-hour rating.

	para., 3 RD sentence	This change is in response to RAI 8.3-34.
216	S8.3.2.1.1, “Safety-Related Batteries,” 2 ND para., 4 TH sentence	Added the statement that the batteries have an expected 20-year service life. This is based on information provided by the VRLA battery vendor and addresses part of RAI 8.3-49 and response to RAI 8.3-38 SO1, supplement from the Staff. (reference the change list for T8.3-6 for the remainder of the RAI response).
217	S8.3.2.1.1, “Safety-Related Batteries,” 3 RD para.	Replaced IEEE 484 with IEEE 1187. The installation of the ESBWR safety-related VRLA batteries is covered by IEEE 1187. IEEE 484 covers vented lead acid batteries.
218	S8.3.2.1.1, “Safety-Related Battery Chargers,” 1 ST para.	Removed the stipulation that the standby battery charger equalizes the batteries off-line. The standby chargers can equalize on-line or off-line.
219	S8.3.2.1.1, “Safety-Related Battery Chargers,” 3 RD para.	In describing battery charger capability of recharging with 24 hours, changed “to 95% of fully charged condition” to “a fully charged condition.” This change is in accordance with battery vendor documentation. Reference RAI 8.3-40 and RAI 8.3-34 SO1, NRC Supplement Response.
220	S8.3.2.1.1, “Inspection, Maintenance, and Testing,” 1 ST para., 2 ND sentence	Revised to change that battery capacity tests are in accordance with IEEE Std. 1188 rather than IEEE 450. IEEE 1188 is specific to VRLA batteries, which the ESBWR will utilize.
221	S8.3.2.1.1, “Inspection, Maintenance, and Testing,” 2 ND para.	Changed “plant-specific Technical Specifications” to “ESBWR Technical Specifications that conform to IEEE 1188 and manufacturer recommendations.” Technical Specifications are not plant-specific.
222	S8.3.2.1.2	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
223	S8.3.2.1.2, “Nonsafety-Related Batteries,” 1 ST para.	Changed the maximum equalizing charge voltage for 125V batteries from 140 VDC to 141 VDC. This is based on a 60-cell battery per battery vendor instructions.
224	S8.3.2.1.2, “Nonsafety-Related Batteries,” 2 ND para.	Changed the maximum equalizing charge voltage for 250V batteries from 280 VDC to 282 VDC. This is based on a 120-cell battery per battery vendor instructions.
225	S8.3.2.1.2, “Nonsafety-Related Batteries,” 4 TH	Deleted the stipulation that the batteries are sized so that the sum of the required loads does not exceed 80% of the battery ampere-hour rating. The 80% was removed, as it is

	para.	not required for nonsafety-related batteries. Nonsafety-related batteries will be sized so the sum of the required loads does not exceed the battery ampere-hour rating.
226	S8.3.2.1.2, “Nonsafety-Related Battery Chargers,” 2 ND para., 2 ND sentence	Appended the statement that standby chargers are supplied from a different power center than the main charger with “except where both are supplied from the swing bus.” See Figure 8.1-5.
227	S8.3.2.1.2, “Ventilation”	Added reference to Subsection 8.3.2.1.1 and Subsection 9.4.6.
228	S8.3.2.2.1	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
229	S8.3.2.2.1, 1 ST para., 3 RD sentence	Removed reference to the Isolation Power Centers hard-wired connection to a terminal box for connection to a portable emergency generator. The transportable AC generator referenced has been deleted from the ESBWR design. This change is in response to RAI 8.3-4.
230	S8.3.2.2.2	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
231	S8.3.2.2.2, “GDC”	Deleted “(DC only)” after GDCs 17 and 18. This is consistent with the commitments in Table 8.1-1.
232	S8.3.2.2.2, “Regulatory Guides”	The discussion of RG 1.6 added, “However, the ESBWR offsite and onsite nonsafety-related power sources do comply with independence and redundancy between their sources and distribution systems.” For RG 1.128 and 1.129, added the qualifying statements from S8.1.5.2.4 for consistency of compliance and editorial clarification.
233	S8.3.3, 1 ST para.	Added the statement, “Further circuit analysis is provided in Section 9A.6.”
234	S8.3.3.2	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-

		related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
235	S8.3.3.2, 2 ND para., 3 RD sentence	Deleted the statement, “Refer to Subsection 8.3.4.5 for certified cable proof tests. The COL item previously located at 8.3.4.5 has been deleted. Added the description of cable proof tests on cable samples moved from 8.3.4.5, which will be standard in the ESBWR design.
236	S8.3.3.3, New 2 nd para	Paragraph was moved from S8.2.3.
237	S8.3.4.1	Deleted the COL item “Interrupting Capacity of Electrical Distribution Equipment.” Interrupting capacity is already addressed in Subsection 8.3.1.1.5 of the ESBWR standard plant design. No COL action is required.
238	S8.3.4.2	Deleted the COL item “Defective Refurbished Circuit Breakers.” The discussion regarding refurbished breakers has been moved to Subsection 8.3.1.1.5 of the ESBWR standard plant design. No COL action is required.
239	S8.3.4.3	Deleted the COL item “Non-Safety Standby Diesel-Generator Load Table Changes.” The nonsafety-related diesels, which are not required for safe shut-down, do not have the time constraints of an active plant or require any rapid loading. See Subsection 8.3.1.1.8. Table 8.3-4 has also been deleted. No COL action is required.
240	S8.3.4.4	Deleted the COL item “Minimum Starting Voltages for Class 1E Motors.” BTP PSB1 (Subsection 8.1.5.2.4) requires protection against degraded voltage for safety-related systems. BTP PSB1 is not applicable to the ESBWR design, because no 480VAC safety-related motors are required for the safe shutdown of the ESBWR design for 72 hours. Degraded voltage in the offsite power system does not affect the safety-related systems as all safety-related systems are powered from batteries. Degraded voltage sensed at battery chargers will be isolated from the battery. The rectifier diodes will block degraded voltage and the batteries will supply constant voltage to the inverters during degraded voltage. See Subsection 8.3.1.1.2. No COL action is required. This change addresses RAI 8.2-13 and RAI 8.3-10 SO1.
241	S8.3.4.5	Deleted the COL item “Certified Proof Tests on Cable Samples.” Cable proof tests will be retained in the equipment qualification database. This is part of the ESBWR standard plant design. See Subsection 8.3.3.2. No

		COL action is required.
242	S8.3.4.6	Deleted the COL item “Associated Circuits.” As described in Subsection 8.3.1.3.1, the ESBWR standard plant design will eliminate safety-related associated circuits as defined by IEEE 384 and in accordance with RG 1.75. No COL action is required.
243	S8.3.4.7	Deleted the COL item “Electrical Penetration Assemblies.” Subsections 8.3.1.1.5 and 8.3.1.4.1 specify design requirements for electrical penetration assemblies. Fault current clearing-time curves of the electrical penetrations’ primary and secondary current interrupting devices plotted against the thermal capability curve of the penetration are included in the detailed design. No COL action is required. This response, as agreed too with the Staff in phone conversation of 1/22/07, answers RAI 8.3-33 SO1.
244	S8.3.4.8	Deleted the COL item “DC Voltage Analysis.” See subsections 8.3.2.1, 8.3.2.1.1, and 8.3.2.1.2 for the ESBWR standard plant design. No COL action is required.
245	S8.3.4.9 (new S8.3.4.1)	Changed from a COLA item to a procedural commitment.
246	S8.3.4.10	Deleted the COL item “Testing of Thermal Overload Bypass Contacts for Motor Operated Valves.” The ESBWR design does not have safety-related motor operated valves, therefore this subsection is not applicable. No COL action is required.
247	S8.3.4.11	Deleted the COL item “Emergency Operating Procedures for Station Blackout.” EOPs are developed as described in Ch. 13. No COL action is required.
248	S8.3.4.12, (new S8.3.4.2)	Changed from a COLA item to a procedural commitment.
249	S8.3.4.13	Deleted the COL item “Common Industrial Standards Referenced in Purchase Specifications.” References for ESBWR purchase specs, such as ANSI, ASTM, IEEE, NEMA, and UL, are found within Subsection 8.3.5 as part of the ESBWR standard plant design. No COL action is required.
250	S8.3.4.14	Deleted the COL item “Periodic Testing of Batteries.” The periodic testing of batteries in accordance with RG 1.129 and IEEE 1188 is addressed within the Surveillance Requirements of Sections 3.8 of ESBWR Technical Specifications. No COL action is required.
251	S8.3.5, Ref. 8.3-8	Replaced IEEE 450 with IEEE 1188, “Recommended Practice for Maintenance, Testing, and Replacement of

		Valve-Regulated Lead-Acid Batteries for Stationary Applications.” This change is consistent with the VRLA batteries that will be utilized as part of the ESBWR standard plant design.
252	S8.3.5, Ref. 8.3-9	Replaced IEEE 484 with IEEE 1187, “Recommended Practice for Installation Design and Installation of Valve-Regulated Lead-Acid Batteries for Stationary Applications.” This change is consistent with the VRLA batteries that will be utilized as part of the ESBWR standard plant design.
253	S8.3.5, Ref. 8.3-12	Added IEEE Standard C57.12.00, which is moved from Subsection 8.2.5.
254	S8.3.5, Ref. 8.3-13 and 8.3-14	Added IEEE 323, “Standard for Qualifying Class 1E Equipment for Nuclear Power Generation Stations,” and IEEE 344, “Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generation Stations” under References.
255	S8.3.5, Ref. 8.3-15	Added IEEE 519, “Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems” under References. This change is in response to RAI 8.4-1.
256	S8.3.5, Ref. 8.3-16	Added IEEE 379, “Application of the Single-Failure Criterion to Nuclear Power Generating Station Safety Systems.”
257	S8.3.5 Ref. 8.3-17 to Ref. 8.3-36	Added standards moved from Table 8.3-2. Table 8.3-2 is deleted in an effort to consolidate all applicable standards.
258	S8.3.5	Added IEEE C37.20.2, “Standard for Metal-Clad Switchgear,” as clarification.
259	S8.3.5	Changed IEEE C57.12.11 to IEEE C57.93, “Guide for Installation of Liquid-Immersed Power Transformers.” The IEEE has superseded IEEE C57.12.11.
260	S8.3.5	Added IEEE 338, “Criteria for the Periodic Surveillance Testing of Nuclear Generating Station Safety Systems.”
261	S8.3.5	Added IEEE C37.013, “Standard for AC High-Voltage Generator Circuit Breakers on a Symmetrical Current Basis.”
262	S8.3.5	Added IEEE 308, “Criteria for Class 1E Power Systems for Nuclear Power Generating Stations.”
263	T8.3-2	Moved standards listed in Table 8.3-2 to Subsection 8.3.5. This consolidates all applicable standards to

		Subsection 8.3.5. Table 8.3-2 is deleted.
264	T8.3-4	Deleted T8.3-4, “Diesel-Generator Loads and Sequencing of Loads.” There are no large, safety-related inductive loads on the nonsafety-related PIP buses. Also, the ESBWR passive design does not require the rapid loading required of active plants. The COL item associated with this table has also been deleted.
265	T8.3-5	Deleted T8.3-5, “Associated Circuits Table.” There should be no associated circuits in the standard ESBWR plant design. Any unit-specific associated circuits will be identified and justified after completion of detailed design. The COL item associated with this table has also been deleted.
266	T8.3-6	Deleted T8.3-6, “Class 1E Battery Loading Profile.” This information is covered in ITAAC 2.13.3-1, 3a and is related to RAI 8.3-52 and part of RAI 8.3-49 (reference 8.3.2.1.1 for the remainder of the RAI response).
267	T8.3-7	Deleted T8.3-7, “Amp. Hour Load Table for 72 Hour Battery Rate.” This information is covered in ITAAC 2.13.3-1, 3a and is related to RAI 8.3-52 and part of RAI 8.3-49 (reference 8.3.2.1.1 for the remainder of the RAI response).
268	F8.3-1	Updated figures to reflect current design bases and delete unnecessary details, to be specified during detailed design.
269	F8.3-2	Deleted the Figure “Fault Current Clearing Time Curves – Electrical Penetrations.” This figure will be part of detailed design.
270	F8.3-3	Deleted the Figure “Protective Devices for Electric Penetrations.” This figure will be part of detailed design.
271	S8A.1.1, 1 ST para., 4 TH bullet	Changed reference to protection provided by lighting protection network to include “all” structures, transformers, and equipment. Removed phrase “located outside buildings.”
272	S8A.1.1, 5 TH para., 1 ST sentence	Changed “station-grounding grid” to “plant-grounding grid.”
273	S8A.1.1, 5 TH para., 2 ND sentence	Changed “connect” to “connected.”
274	S8A.1.1, 6 TH para.	Re-worded to read, “The plant’s main generator is grounded with a neutral grounding device to limit the magnitude of fault current due to a solid phase-to-ground fault. The impedance of the grounding device limits the

		maximum phase to ground current under short-circuit conditions to a value not greater than that for a three-phase fault at its terminals.” This wording change is to agree with IEEE C37.102.
275	S8A.1.1, 8 TH para., 1 ST sentence	Removed “as necessary” in describing grounding of low-voltage AC distribution system neutral points.
276	S8A.1.1, 9 TH para., 1 ST sentence	Added “and other miscellaneous outdoor buildings,” where the target value of ground resistance is one ohm or less.
277	S8A.1.1, 10 TH para., 3 RD sentence	Changed “offsite line” to “offsite lines.”
278	S8A.1.2, 1 ST sentence	Removed the words “and lightning.” Lighting protection is provided in accordance with RG 1.204. This change is in response to RAI 8.3-22. Added references that refer to S8.1.5.2.4 and T8.1-1.
279	S8A.1.2, item (5)	Replaced NFPA-78, “National Fire Protection Association’s Lightning Protection Code,” with NFPA-780, “Standard for the Installation of Lightning Protection Systems.” This change is the result of an NFPA code change.
280	S8A.1.3	Deleted “COL Unit Specific Information.” Ground resistance measurements are covered as part of ESBWR standard plant design in Subsection 8A.1.1, paragraph 9. No COL action is required.
281	S8A.2.3	Added, “site specific” in front of “analysis”. Editorial clarification.
282	S8A.2.3, items (4) & (5)	Changed “Reference electrodes” to “reference electrodes.”
283	S8A.2.3, item (4)	Removed the words “poorly accessible.” Sentence now reads, “Reference electrodes shall be permanently installed near protected surfaces”. Editorial change.
284	S8A.3	As an editorial change when referring to systems or equipment comprising those systems, many instances of “Class 1E” and “non-Class 1E” are changed to “safety-related” and “nonsafety-related,” respectively. Safety-related systems/equipment meet the Class 1E requirements defined in IEEE 308 and IEEE 603. This change addresses RAI 8.1-17.
285	S8A.3.1, 1 ST sentence	Changed the words “in or out doors” to “indoors or outdoors.”
286	S8A.3.2	Deleted the second and third sentence since they are redundant with S8A.2.3, second and third sentences.

287	S8A.3.3	Deleted the Subsection “COL Information.” Revision 2 already contained no COL items in this Subsection. The heading was deleted, as there was no content below.
288	S8A.4	Replaced NFPA-78, “National Fire Protection Association’s Lightning Protection Code,” with NFPA-780, “Standard for the Installation of Lightning Protection Systems.” This change is the result of an NFPA code change.
289	S8B	Section 8B, “Station Blackout Evaluation,” was deleted in Rev. 2, as the SBO safety analysis is provided in Subsection 15.5.5. Revision 3 deleted the page which held the title of Appendix 8B, as it had no content.