

ESBWR DCD Chapter 9 – Auxiliary Systems
22A6642AY Revision 1 to Revision 2 Change List

| Item | Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure) | Description of Change |
|-------------|--|---|
| 1 | Acronym List | Updated acronyms for various HVAC systems to match new acronyms used in Section 9.4 |
| 2 | Acronym List | Inserted new acronyms: DX Direct Expansion EMI Electromagnetic Interference IESNA Illuminating Engineering Society of North America RFI Radio Frequency Interference |
| 3 | S9.1.1.1 | Replaced subsection references in the Thermal Hydraulic Design and Material Considerations paragraphs with appropriate text. |
| 4 | S9.1.1.3, Protection Features of New Fuel Storage Facilities | Changed last sentence of third paragraph to read: "Procedures are written for fuel handling." |
| 5 | S9.1.2.4, second paragraph | Revised first part of paragraph to read: "The Spent Fuel Pool and buffer pool are reinforced concrete structures with a stainless steel liner. Fuel storage racks and pool liner embedments are designed to meet Seismic Category I requirements. Pool liner and anchorage are designed to the same loads and load combinations as the pool concrete structure in accordance with DCD Table 3.8-15, except that load factors for all cases are equal to 1.0 and the acceptance criteria follow ASME Section III, Division 2, CC 3700. Pool liners will be evaluated to ensure structural integrity under fuel handling accidents." (Incorporated in response to RAIs 9.1-6 and 9.1-15). |
| 6 | S9.1.2.4, last paragraph | Added "In addition, the design of the spent fuel storage racks and associated support structures meet the requirements of Appendix D to SRP 3.8.4." to end of paragraph. (Incorporated in response to RAI 3.8-69) |
| 7 | S9.1.2.7, last paragraph | Deleted "at least 3.0 m (10 ft)". |
| 8 | S9.1.3.1, Safety Design Basis | Inserted: ", the high-pressure interface with the Reactor Water Cleanup / Shutdown Cooling System," in middle of sentence to clarify description of safety-related portion of FAPCS. |

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| 9 | S9.1.3.1, Power Generation Design Basis | Typographical error correction. Changed "containments" to "containment" |
| 10 | S9.1.3.2, System Description Summary | Editorial clarification in first paragraph. Changed "redundant" to "100% capacity". |
| 11 | S9.1.3.2, System Description Summary | Inserted new paragraph after bullet for "Alternate Shutdown Cooling" that reads: "In addition to its accident recovery function, suppression pool cooling (SPC) mode is also designed to automatically initiate during normal operation in response to a high temperature signal from the suppression pool." |
| 12 | S9.1.3.2, System Description Summary | Inserted new paragraph after paragraph beginning with "Each FAPCS C/C train ..." that reads: "During a loss of the FAPCS cooling trains, the cooling to the Spent Fuel Pool and IC/PCCS pools is accomplished by allowing the water to heat and boil. Sufficient pool capacity exists for pool boiling to continue for at least 72 hours post-accident, at which point emergency makeup water can be provided through safety related connections to the Fire Protection System (FPS) or another onsite or offsite water source." |
| 13 | S9.1.3.2, System Description Summary | Added "by including anti-siphon holes on all FAPCS piping that is normally submerged" to end of paragraph starting with "All operating modes ..." |
| 14 | S9.1.3.2, System Description Summary | Revised paragraph starting with "The containment isolation valves..." to read: "The containment isolation valves are automatically closed upon receipt of a containment isolation signal from the Leakage Detection and Isolation System (LD&IS). The containment isolation valves needed to perform an accident recovery function described above, will require a manual operator action to override the isolation signal." |

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| 15 | S9.1.3.2, System Description Summary | <p>Replaced first sentence of last paragraph with:</p> <p>"The FAPCS is a nonsafety-related system with the exception of piping and components required for:</p> <ul style="list-style-type: none"> • Containment isolation • Refilling of the IC/PCCS pools and the Spent Fuel Pool with emergency water supplies from the Fire Protection System or another onsite or offsite source. • The high-pressure interface with the Reactor Water Cleanup/Shutdown Cooling system used for low pressure coolant injection." |
| 16 | S9.1.3.2, Detailed System Description | Deleted "for redundancy" at end of first sentence in first paragraph. |
| 17 | S9.1.3.2, Detailed System Description | Changed "Spent Fuel Pool" to "fuel pools" near middle of second paragraph. |
| 18 | S9.1.3.2, Detailed System Description | <p>Changed paragraph starting with "A reactor makeup water ..." to read: "A reactor makeup water discharge line is provided for injecting suppression pool water or water from the Fire Protection System to the reactor vessel via Reactor Water Cleanup/Shutdown Cooling System (RWCU/SDC) Loop B and Feedwater Loop A discharge pipes. This line is safety-related up to the second isolation valve upstream of the RWCU/SDC interface. This isolation valve is normally closed, and prevented from opening by a high reactor pressure signal from the Nuclear Boiler System to protect the low pressure portion of FAPCS piping and components."</p> |
| 19 | S9.1.3.2, Detailed System Description | <p>In paragraph starting with "A drywell spray discharge line...", the following text was added: "In order to prevent excessive negative pressure the drywell spray flow rate must be less than 227 m³/hr (1000 gpm). The drywell spray flow rate is maintained below this value by a flow-restricting orifice."</p> |

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| 20 | S9.1.3.2, Detailed System Description | Paragraph after bullet starting with "An isolation valve inside ..." revised to read: "All lines that penetrate primary containment are equipped with inboard and outboard containment isolation valves, with the exception of the suppression pool suction line. The outboard isolation valves are air-operated and located as close as possible to the containment. The containment isolation valves are automatically closed, if open, upon receipt of a containment isolation signal from the LD&IS. The suppression pool suction line shall be equipped with only one isolation valve outside containment in accordance with the criteria in SRP 6.2.4 (see Table 1.9-20)." |
| 21 | S9.1.3.2, Detailed System Description | Editorial change. In paragraph starting with "Piping and components completely separate ...", the middle sentence was revised to state: "Active FAPCS valves located inside the Reactor Building are not required to operate to accomplish this makeup." |
| 22 | S9.1.3.2, Detailed System Description | Immediately after the paragraph starting with "Piping and components completely separate ...", the following new paragraph was inserted: "The Dryer/Separator Pool and Reactor Well contains valves that, when opened, create a connection between the two IC/PCCS expansion pools through the Dryer/Separator Pool. These valves are designed to open on receiving a low level signal from either of the IC/PCCS expansion pools, and will allow the IC/PCCS Pools to utilize the inventory in the Dryer/Separator Pool and Reactor Well." (Incorporated in response to RAI 9.1-22) |
| 23 | S9.1.3.2, Detailed System Description | Next to last paragraph starting with "Containment isolation valves are ..." was replaced with "Branch connections are provided on the suppression pool suction line and return line, which serve as attachments for portable external cooling equipment that bypasses the FAPCS C/C trains." |
| 24 | S9.1.3.2, System Operation | Deleted "that do not have a post-accident recovery function" from next to last paragraph. |

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| 25 | S9.1.3.2, System Operating Modes | Editorial change. Replaced "operate in operating modes" with "operate in the modes". |
| 26 | S9.1.3.2, Spent Fuel Pool Cooling and Cleanup Mode | Added new sentence: "As the SFP level rises, water will spill into the weir and flow back to the skimmer surge tanks." near end of paragraph. In preceding sentence, added "(SFP)" after "Spent Fuel Pool" to define acronym. |
| 27 | S9.1.3.2, IC/PCCS Pool Cooling and Cleanup Mode | Revised last two sentences to read: "During this mode of operation, water is drawn via a common suction header from each IC/PCCS subcompartment. Water is cooled and cleaned by the IC/PCCS pool C/C subsystem and is then returned to the two expansion pools through a common line that branches and discharges deep into each pool." (Incorporated in response to RAI 9.1-22) |
| 28 | S9.1.3.2, GDCS Pool Cooling and Cleanup Mode | Renumbered GDCS pools to match GDCS trains to which they are connected. Pool B was changed to Pool B/C and Pool C was changed to Pool D. |
| 29 | S9.1.3.2, Suppression Pool Cooling and Cleanup Mode | Replaced last sentence with: "This mode may be manually initiated following an accident to cool the suppression pool for accident recovery. This mode may also be automatically initiated during normal operation in response to a high temperature signal from the suppression pool." |

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| 30 | S9.1.3.3 | <p>Replaced first sentence of first paragraph with what follows below. Remainder of first paragraph split off as a stand-alone paragraph after this text:</p> <p>"The FAPCS is a nonsafety-related system except for the portions of the system that establish flow paths necessary for</p> <ul style="list-style-type: none"> • The interface with safety-related RWCU/SDC piping • The supply of emergency makeup water to the Spent Fuel pool and IC/PCCS pools following an accident • The system's containment isolation function <p>The SFP is designed to dissipate fuel decay heat through heat up and boiling of the pool water. The pool water performs the safety-related heat removal function stipulated in GDC 44. Upon loss of power, the Fuel Building HVAC isolates the fuel building as described in Subsection 9.4.2.5. Steam generated by boiling of the SFP is released to the atmosphere (the ultimate heat sink) through a relief panel in the Fuel Building. Water inventory in the SFP is adequate to keep the fuel covered through 72 hours, thereby avoiding heat up of the fuel and the potential for fission product release. Engineered safety feature atmosphere cleanup systems and associated guidance described in RG 1.52 are not provided in the ESBWR design as indicated in Subsection 15.4.1.4.1. The Fuel Building does not house any safety-related equipment, subject to flooding, as stated in Subsection 3.4.1.4.3. Sufficient reserve capacity is maintained on-site to extend the safe shutdown state from 72 hours through 7 days ensuring compliance with GDC 61. Post 72-hour inventory makeup is provided via safety-related connections to the Fire Protection System and to offsite water sources." (Incorporated in response to RAI 9.1-8)</p> |
| 31 | S9.1.3.3 | Deleted next to last paragraph and its bullets that discussed use of a single containment isolation valve. |

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| 32 | S9.1.3.5, System Instrumentation, Water Levels | First paragraph – Deleted "detector and" in first sentence. Inserted "Condensate Storage and Makeup System" in last sentence. Second paragraph – Inserted "for both expansion pools" at end of first sentence. Fourth paragraph – Deleted "suppression pool" and inserted "lower fuel transfer pool, cask pool". Added new fifth paragraph as follows: "Level instruments for the suppression pool and GDCS pools are provided by other systems." |
| 33 | S9.1.3.5, System Instrumentation, Water Temperatures | Deleted "elements and local panel mounted temperature" in three locations. Changed "condenser vault" to "condenser subcompartments" in second sentence. |
| 34 | S9.1.3.5, System Controls | Correction in first paragraph. Changed "Leak Detection and Isolation system" to "Containment Monitoring System" as source for automatic initiation signal. |
| 35 | S9.1.3.5, System Controls | Revised second paragraph and its two bullets with: "Upon receipt of a containment isolation signal from the Leak Detection and Isolation System, all containment isolation valves are signaled to close (thus overriding automatic SPC mode)." |
| 36 | S9.1.4.18, next to last paragraph | Updated cross reference to read "Subsection 3.1.6.2." to more precisely define source of information. |
| 37 | S9.1.5.6, Upper Drywell Servicing Equipment | Changed "refueling outage" to "plant outage" in second paragraph. |
| 38 | S9.1.6 | Deleted subsection on Fuel Handling Procedural Control. |
| 39 | Table 9.1-1 | Deleted "Cask Head Shelf Pool" from "Fuel Pools" row. |
| 40 | Table 9.1-1 | Renumbered GDCS pools to match GDCS trains to which they are connected. Pool B was changed to Pool B/C and Pool C was changed to Pool D. Replaced "GDC" with "GDCS" in name of pools. |
| 41 | Table 9.1-2 | Rearranged numbering of FAPCS operating modes. Drywell spray is now mode 7, other mode numbers each increased by 1. |

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| 42 | Table 9.1-3 | Replaced "Q" with "2" for items 1 and 2 in table. Replaced "Q" with "3" for items 3, 4, 11 and 12 in table. |
| 43 | Table 9.1-3, Item 2 | Revised item description to read: "Piping between inboard manual valve and outboard containment isolation valve on suppression pool suction line, as well as the LPCI piping between the RWCU/SDC interface and the second isolation valve" |
| 44 | Table 9.1-3, Item 5 | Revised item description to read: "Piping and components outside containment required for SFP Cooling, SPC, LPCI and Drywell Spray modes of operation including skimmer lines and all components of the cooling and cleanup trains." |
| 45 | Table 9.1-3, Item 10 | Revised item description to read: "Auxiliary pools skimmer lines and auxiliary pools return lines between the isolation valves and terminating points" |
| 46 | Table 9.1-3, Item 11 | Changed "post-accident monitoring instruments" to "parameters" and removed "Spent Fuel Pool Water Temperature" because some of instruments in list were not part of the official post-accident monitoring instruments and because monitoring of spent fuel pool level is sufficient to confirm fuel is being maintained in a safe condition. |
| 47 | Table 9.1-4 | Changed heading of second column to "Safety Class" to match changes made to Table 3.2-1 in response to RAI 3.2-3 and other related RAIs. |
| 48 | Table 9.1-4 | Split listing for fuel servicing equipment into two separate line items per RAI 9.1-1 so that the fuel preparation machine can be shown as Seismic Category II. |
| 49 | Table 9.1-5 | A new column was added to the table per RAI 9.1-26 to identify the devices to which the list of codes and standards apply. |
| 50 | Figure 9.1-1 | Figure updated to show new names for GDSCS pools and to show redundant connections to fire protection system per RAIs 9.1-13 and 9.1-22. |

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| 51 | S9.2.1.2 Detailed System Description first and seventh paragraphs | Editorial. Changed "raw water" to just "water". |
| 52 | S9.2.1.2 Detailed System Description third paragraph | Deleted "The COL license information requirements for the service water basin are stated in Section 9.2.9." COL information was moved to 9.2.1.6. |
| 53 | S9.2.1.2 Detailed System Description eight paragraph | Replaced "Provision for anti-fouling treatment of the PSWS is provided." with "Provisions to preclude long-term corrosion and fouling of PSWS are provided." |
| 54 | S9.2.1.2 Detailed System Description following ninth paragraph | Added "The PSWS design permits detection and alarming in the MCR of any potential gross leakage and permits the isolation of any such leak in a sufficiently short period of time to preclude extensive plant damage. Means are provided to detect leakage into the PSWS from the RCCWS, which may contain low levels of radioactivity." |
| 55 | S9.2.1.4 first paragraph | Deleted "heat exchangers" in first sentence because they do not belong to PSWS. Added a sentence "This initial testing of the system will include demonstrating that PSWS supplies adequate cooling water flow rate to the RCCWS and TCCWS heat exchangers." |
| 56 | S9.2.1.4 second paragraph | Added "ANSI/HI 2.6 (M108)" in response to RAI 9.2-5 to delineate under which Hydraulic Institute standard the pumps are to be tested. |

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| 57 | S9.2.1.6 | <p>Added subsection 9.2.1.6 with the following COL Unit-Specific Information:</p> <p>The design of the ESBWR Standard Plant cooling water systems is based on bounding ambient environmental conditions as defined in Chapter 2 as well as generic BWR water quality requirements. Based on actual site conditions, the COL applicant will provide the design of the PSWS, including, but not limited to, the following parameters:</p> <ul style="list-style-type: none"> • System configurations (once through versus closed loop) and materials • Heat rejection facilities (natural draft versus mechanical cooling towers) • Heat removal capacities of PSWS • Performance characteristics of cooling water system components • PSWS makeup and blowdown capacities • Service water basin, or other site-specific water supply. <p>The ESBWR Standard Plant required cooling capacity is provided in Table 9.2-1.</p> <p>The COL applicant will also provide the design of a station water system to provide makeup for the Cooling Water Systems, Makeup Water System, and Potable Water."</p> |
| 58 | S9.2.1.7 | <p>Added subsection 9.2.1.7 with the following Reference: ANSI/HI 2.6 (M108) American National Standard for Vertical Pump Tests, (see Table 1.9-22)</p> |
| 59 | S9.2.2.2 Detailed System Description sixth paragraph | <p>Added reference Subsection 9.5.5 following "Standby On Site AC Power Supply Diesel Generators"</p> |
| 60 | S9.2.2.4 first paragraph | <p>Corrected reference to Subsection 14.2.8.1.24 in the following to read "Additional testing details of RCCWS are described in Subsection 14.2.8.1.21."</p> |

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| 61 | S9.2.2.6 | <p>Added new COL Information section. Contents:</p> <p>“The design of the ESBWR Standard Plant cooling water systems is based on bounding ambient environmental conditions as defined in Chapter 2 as well as generic BWR water quality requirements. Based on actual site conditions, the COL applicant will provide the design of the RCCWS, including, but not limited to, the following parameters:</p> <ul style="list-style-type: none"> • System configurations (once through versus closed loop) and materials • Heat removal capacities of RCCWS • Performance characteristics of RCCWS components • RCCWS makeup and blowdown capacities <p>The PSWS cold leg temperature and RCCWS heat exchanger plate material in Table 9.2-4 are site specific items.”</p> |
| 62 | S9.2.2.7 | <p>Added new References section. Contents:</p> <p>“None.”</p> |
| 63 | S9.2.3.1 first paragraph | <p>Added “The MWS meets GDC 2, as it relates to meeting the guidance of Regulatory Guide (RG) 1.29. The applicable sections of RG 1.29 include Position C.1 for safety-related portions and Position C.2 for nonsafety-related portions.” (Incorporates response to RAI 9.2-1)</p> |
| 64 | S9.2.3.1 first paragraph | <p>Added “The seismic and quality group classifications are identified in Table 3.2-1.” (Incorporates response to RAI 9.2-2)</p> |
| 65 | S9.2.3.6 | <p>Added new "COL Information" section. Contents: “The COL applicant shall specify the Makeup Water System design”</p> |

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| 66 | S9.2.3.7 | Added new "References" section. Contents: 9.2.3-1 Reg Guide 1.29 "Seismic Design Classification" (see Table 1.9-21) 9.2.3-2 ASME Boiler and Pressure Vessel Code (B&PVC), Section XI - Rules for Inservice Inspection of Nuclear Power Plant Components (see Table 1.9-22) |
| 67 | S9.2.4 | Replaced "This is beyond the ESBWR Standard Plant Scope. Refer to Subsection 9.2.9 for COL license information requirements of Potable and Sanitary Water Systems." with "The COL applicant will provide the design of the potable and sanitary water system that provides sufficient supply and is designed to provide a minimum of 12.6 l/s (200 gpm) of potable water during peak demand periods. The COL applicant will provide design of wastewater effluent systems that properly disposes of cooling system tower blowdown, and sanitation wastes." |
| 68 | S9.2.5 | Added "and Spent Fuel Pool" following "In the event of an accident, the UHS is the atmosphere with the Isolation Condenser / Passive Containment Cooling System (IC/PCCS) pools". (Incorporates response to RAI 2.4-5 from MFN 06-226). |
| 69 | S9.2.5 | Deleted last two sentences. COL information moved to new Subsection 9.2.5.1. |
| 70 | S9.2.5.1 | Added new "COL Information" section. Contents: "The COL applicant will identify the external water resource and procedures to use the resource as an emergency makeup water supply to the IC pools and fuel pools following an accident." |
| 71 | S9.2.5.2 | Added new References section. Contents: "None." |
| 72 | S9.2.6.6 | Added new "COL Information" section. Contents: "None." |

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| 73 | S9.2.6.7 | Added new References section. Contents: “None.” |
| 74 | S9.2.7.1 Power Generation Design Basis, first and second paragraph | Deleted the following specific temperature information: “at 7°C (44.6°F)” and “This is based on 35°C (95°F) or less RCCWS and TCCWS cooling water available to the NICWS and BOPCWS condensers respectively. The CWS is designed to remain functional and capable of supporting normal plant operation when supplied with RCCWS and TCCWS cooling water up to 37°C (100°F).” This information is provided in Table 9.2-11 and does not need to be repeated in the text. |
| 75 | S9.2.7.1 Power Generation Design Basis, following third paragraph | Added the following generic information regarding the Offgas System interface: “The heat exchangers associated with the Offgas System (OGS) handle potentially radioactive material at an operating pressure lower than the pressure of the water that cools it. Any tube leakage, therefore, results in a flow from the CWS to the OGS.” |
| 76 | S9.2.7.2 Detailed BOPCWS Description, fifth paragraph, second bullet | Deleted specific temperature information such that second bullet now reads: "The chiller units are capable of operating at partial capacity; varying from less than 25% to 100%." The detailed temperature information is provided in Table 9.2-11 and does not need to be repeated in the text. |
| 77 | S9.2.7.4 third paragraph. | Added “ANSI/HI 1.6 (M104)” in response to RAI 9.2-5 to delineate under which Hydraulic Institute standard the pumps are to be tested. |
| 78 | S9.2.7.6 | Added new "COL Information" section. Contents: The CWS cooling capacity and other CWS component design characteristics are defined in Table 9.2-11. The COL applicant will determine CWS makeup and blowdown capacities. |

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| 79 | S9.2.7.7 | <p>Added new References section. Contents:</p> <p>9.2.7-1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) Standard 30, Methods of Testing Liquid-Chilling Packages, (see Table 1.9-22)</p> <p>9.2.7-2 ANSI/HI 1.6 (M104), Centrifugal Tests, (see Table 1.9-22)</p> |
| 80 | S9.2.8.1 Power Generation Design Basis, second paragraph. | <p>Deleted “at a maximum temperature of 35°C (95°F)” following “During power operation, the TCCWS operates to provide a continuous supply of cooling water”.</p> <p>The detailed temperature information has been relocated to Table 9.2-12.</p> |
| 81 | S9.2.8.5 second paragraph | <p>Deleted “from the TCCWS local control panels” following “Surge tank high and low level and TCCWS discharge pressure alarms are transmitted to the MCR”</p> |
| 82 | S9.2.8.6 | <p>Added new "COL Information" section. Contents:</p> <p>The design of the ESBWR Standard Plant cooling water systems is based on bounding ambient environmental conditions as defined in Chapter 2 as well as generic BWR water quality requirements. Based on actual site conditions, the COL applicant will provide the design of the TCCWS, including, but not limited to, the following parameters:</p> <ul style="list-style-type: none"> • Heat removal capacities of TCCWS • Performance characteristics of TCCWS components • TCCWS makeup and blowdown capacities <p>The main system parameters are defined in Table 9.2-12.</p> |
| 83 | S9.2.8.7 | <p>Added new section "COL Information" Contents:</p> <p>"None."</p> |

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| 84 | S9.2.9 | Completely deleted Subsection 9.2.9 “COL Information” from Revision 1 and replaced it with new Subsection 9.2.9 titled “Hot Water System”. Information in old Subsection 9.2.9 that still applies has been redistributed to COL Information subsections added at the end of Subsections 9.2.1 through 9.2.8. |
| 85 | S9.2.10 | Completely deleted Subsection 9.2.10 “References”. Information in old Section 9.2.10 that still applies has been redistributed to References subsections added at the end of Subsections 9.2.1 through 9.2.8. |
| 86 | Table 9.2-1 | Added LOPP Operation Heat Loads to bottom of Table as follows: Total for Trains A and B Single Train, 2 PSWS Pumps 88.0 MW 3.20 x 10 ⁸ Btu/hr Both Trains, 4 PSWS Pumps 140.4 MW 5.20 x 10 ⁸ Btu/hr |
| 87 | Table 9.2-12 | Added “Maximum cold leg temperature 35°C (95°F)” to bottom of Table. |
| 88 | S9.3.2.1 | Changed "Section" to "Subsection" |
| 89 | S9.3.2.2 | Deleted last two sentences of Summary Description section that started with "Additional parameters ...". Information was moved to new Subsection 9.3.2.6. |
| 90 | S9.3.2.6 | Added new COL Information section. Contents: "The COL applicant shall determine the locations of the actual sample points and the process measurements based on site conditions and actual equipment. The COL applicant shall determine the actual location for conditioning and analysis of the main steam sample." |
| 91 | S9.3.2.7 | Added new References section. Contents: 9.3.2-1 ASME B31.1, Power Piping (see Table 1.9-22). |

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| 92 | S9.3.3.2, Summary Description | Inserted following as next to last paragraph in section: "Dedicated sumps in the EFDS shall collect vent and drain water from the closed loop RCCWS and shall be directed to the Reactor Building Cooling Water Drain Subsystem. The size of this subsystem shall accommodate the draining of the largest isolable cooling water pipe segment in the Reactor Building. The sump contents shall be evaluated for radioactivity and water quality. If the cooling water is radioactively contaminated, it shall be directed to the LWMS, where it can be processed. If not, the cooling water may be recycled through a line tied back to the cooling water system." (Incorporates response to RAI 9.3-2) |
| 93 | S9.3.3.2, Detailed System Description | Deleted last sentence: "The COL applicant shall determine the final size of the drywell sump." |
| 94 | S9.3.3.4 | Removed specific value for test pressure. Text now states pressure testing will be performed in accordance with ASME B31.1. |
| 95 | S9.3.3.6 | Added new "COL Information" section. Contents: "None." |
| 96 | S9.3.3.7 | Added new "References" section. Contents: 9.3.3-1 ASME B31.1, Power Piping (see Table 1.9-22). |
| 97 | S9.3.5.2, first paragraph | Added: "The SLCS process conditions are shown in Figure 9.3-1a." (Incorporates response to RAI 9.3-3) |
| 98 | S9.3.5.3 | Added: "The SLCS is designed to conform with the requirements for equivalent reactivity control capacity specified in 10 CFR 50.62(c)(4)." (Incorporates response to RAI 9.3-7) |

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| Item | Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure) | Description of Change |
|-------------|--|---|
| 99 | S9.3.5.3 | <p>Changed from: “The SLCS is designed to conform to the GDC of 10 CFR 50. The overall requirements (Section I) of the GDC are applicable to the SLCS, and system equipment has been designed and installed in conformance with the presentations in Chapter 3. Other related GDCs are presented individually below:”</p> <p>To: “The SLCS is designed to conform to the GDC of 10 CFR 50. The overall requirements (Section I) of the GDC are applicable to the SLCS, and system equipment has been designed and installed in conformance with the presentations in Chapter 3. For its function to provide makeup water to the RPV during a LOCA, the SLCS is designed to meet the requirements of GDC 17, 35, 36 and 37 and 10 CFR 50.46 in conjunction with the other ECCS systems. Conformance to these criteria is discussed in Section 6.3, Emergency Core Cooling Systems. Other related GDCs are presented individually below:” (Incorporates response to RAI 9.3-5)</p> |
| 100 | S9.3.5.3 | <p>Changed from: “Regulatory Guide 1.26, Quality Group Classifications and Standards: Because the SLCS is a defense-in-depth beyond design basis shutdown system, all mechanical components . . .”</p> <p>To: “Regulatory Guide 1.26, Quality Group Classifications and Standards: Because the SLCS is a defense-in-depth beyond design basis shutdown system and an ECC system, all mechanical components . . .” (Incorporates response to RAI 9.3-13)</p> |
| 101 | S9.3.5.6 and S9.3.5.7 | <p>Added new sections "COL Information" and "References". Contents of both are: "None."</p> |
| 102 | S9.3.6.6 | <p>Added new "COL Information" section. Contents: "None."</p> |

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| Item | Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure) | Description of Change |
|-------------|--|--|
| 103 | S9.3.6.7 | Added new References section. Contents: 9.3.6-1 ASME Boiler and Pressure Vessel Code (B&PVC), Section VIII – Pressure Vessels (see Table 1.9-22) 9.3.6-2 ASME B31.1, Power Piping (see Table 1.9-22) 9.3.6-3 ASME B31.3, Process Piping (see Table 1.9-22) 9.3.6-4 ISA Standard 7.0.01, Quality Standard for Instrument Air (see Table 1.9-22) |
| 104 | S9.3.7.4 | Added "(29 CFR 1910)" at the end of the paragraph as the referenced OSHA standard. |
| 105 | S9.3.7.6 | Added new "COL Information" section. Contents: "None." |
| 106 | S9.3.7.7 | Added new "References" section. Contents: 9.3.7-1 ASME Boiler and Pressure Vessel Code (B&PVC), Section III – Rules for Construction of Nuclear Power Plant Components (see Table 1.9-22) 9.3.7-2 ASME Boiler and Pressure Vessel Code (B&PVC), Section VIII – Pressure Vessels (see Table 1.9-22) 9.3.7-3 ASME B31.1, Power Piping (see Table 1.9-22) 9.3.7-4 ASME B31.3, Process Piping (see Table 1.9-22) |
| 107 | S9.3.8.2, Detailed System Description | Changed "ANSI Piping Code B31.1" to "ASME Piping Code B31.1" in fifth paragraph |
| 108 | S9.3.8.4 | Changed "ANSI/ISA 7.0.01" to "ISA 7.0.01" in second paragraph. |
| 109 | S9.3.8.6 | Added new "COL Information" section. Contents: "None." |
| 110 | S9.3.8.7 | Added new "References" section. Contents: 9.3.8-1 ISA Standard 7.0.01, Quality Standard for Instrument Air (see Table 1.9-22) |
| 111 | S9.3.9.1 | Revised reference number from 9.3-1 to 9.3.9-1. |
| 112 | S9.3.9.2 | Added text "at the time of deployment" to fourth line of section. |
| 113 | S9.3.9.2 | Deleted "by the COL Applicant/Holder" at the end of the section. |

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| Item | Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure) | Description of Change |
|-------------|--|---|
| 114 | S9.3.9.3 | Revised reference number from 9.3-2 to 9.3.9-2. |
| 115 | S9.3.9.4 | Added text "at the time of deployment" to fourth line of section. |
| 116 | S9.3.9.6 | Added new "COL Information" section with the following contents: "None, until COL Applicant/Holder decides to implement a Hydrogen Water Chemistry System per Subsection 9.3.9.1." |
| 117 | S9.3.9.7 | Added new "References" section. References 9.3-1 and 9.3-2 were relocated here from Section 9.3.14 and renumbered as 9.3.9-1 and 9.3.9-2. |
| 118 | S9.3.10.2 | Deleted first two sentences of first paragraph to eliminate COL Applicant action item. |
| 119 | S9.3.10.6 and S9.3.10.7 | Added new sections "COL Information" and "References". Contents of both are: "None." |
| 120 | S9.3.11.1, Power Generation Design Basis | Deleted last sentence of section. Information relocated to 9.3.11.6. |
| 121 | S9.3.11.2 | Text replaced with "See Subsection 9.3.11.6." |
| 122 | S9.3.11.4 | Added "See Subsection 9.3.11.6." at end of section. |
| 123 | S9.3.11.6 | Added new "COL Information" section with contents: "The COL Applicant/Holder shall determine if a Zinc Injection System is required based on the site-specific water quality requirements. COL Applicant/Holder will furnish necessary information on System Description, Test and Inspection when vendor information becomes available." |
| 124 | S9.3.11.7 | Added new "References" section with contents: "None." |
| 125 | S9.3.12.2 | Added "(if required)" to end of third bullet. Deleted COL Applicant action item in last paragraph of section. |

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| Item | Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure) | Description of Change |
|-------------|--|--|
| 126 | S9.3.12.2, Component Description | Made description more generic by eliminating references to Auxiliary Boiler as being an electrical heater. Current preference is to use a fossil-fueled boiler, but exact method of heating has no impact on the design requirements for this system. Changes include deleting "(Electrode type)" from first bullet, deleting bullet "Immersion heaters", deleting "are electrode type heaters, which utilize electricity to" from first paragraph below bullets and deleting "and immersion heaters from fourth paragraph below bullets.. |
| 127 | S9.3.12.3 | Editorial change for procedural compliance. Changed "nuclear safety" to "safety". |
| 128 | S9.3.12.6 and S9.3.12.7 | Added new sections "COL Information" and "References". Contents of both are: "None." |
| 129 | S9.3.13 | Deleted entire section. Information that is still applicable was moved to system-specific subsections throughout Section 9.3. |
| 130 | S9.3.14 | Deleted entire section. References moved to Section 9.3.9.7 |
| 131 | Table 9.3-1 | Changed "Section 9.3.13" to "Subsection 9.3.2.6" in footnote **. |
| 132 | Table 9.3-3 | Changed annotation marker "[KCM763]" to hidden text. (Incorporates response to RAI 9.3-14) |
| 133 | Figure 9.3-1 | Changed injection line shutoff valves from motor-operated (MO) to air-operated (AO). |
| 134 | Figure 9.3-1a | Added new Figure 9.3-1a (Standby Liquid Control System Simplified Process Flow Diagram). (Incorporates response to RAI 9.3-3) |
| 135 | S9.4.1, Title Line | Replaced "Control Room Area Ventilation System" with "Control Building Heating, Ventilation and Air Conditioning System" in response to RAI 9.4-13. |
| 136 | S9.4.1, Generic including Figure 9.4-1 | Replaced CBHVS with CBVS, replaced CRHAHVS with CRHAVS, replaced CBGAHVS with CBGAVS |

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| Item | Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure) | Description of Change |
|-------------|--|---|
| 137 | S9.4.1, Generic | Removed the annotation markers, such as “[raw807]” in Section 9.4.1.1, Page 9.4-2, Line Number 7, and all other areas of 9.4.1 per response to RAI 9.4-16. |
| 138 | S9.4.1 | Inserted “The CRHA envelope can be isolated from the nonsafety-related CRHAVS and protected as described herein during emergency modes of operation.” in the first bulleted paragraph |
| 139 | S9.4.1 | Inserted “envelope” in second bulleted paragraph |
| 140 | S9.4.1.1, Safety Design Basis, first and second paragraphs | Inserted/revised “structure and components, the CRHA isolation dampers, EBAS and its associated instrumentation and controls which are safety-related” in first paragraph. Added “instrumentation and” to second paragraph. |
| 141 | S9.4.1.1, Safety Design Basis | Inserted “CRHA” in first bulleted paragraph |
| 142 | S9.4.1.1, Power Generation Design Basis | Inserted “except during the toxic gas/smoke isolation mode or smoke exhaust mode of emergency operation when power is available” to tenth bullet. |
| 143 | S9.4.1.1, Power Generation Design Basis | Deleted “Details regarding site specific toxic gases will be described by the site specific toxic gas study” in eleventh bullet. |
| 144 | S9.4.1.1, Power Generation Design Basis | Inserted “Smoke control in accordance with NFPA 92A is provided for unsprinklered areas where the Fire Hazards Analysis identifies a potential for heavy smoke or heat conditions” per RAI 9.5-11 as new thirteenth bullet |
| 145 | S9.4.1.2, Summary Description | Inserted “when the CRHA envelope is isolated” and deleted “during a radiological event concurrent with an SBO” from first paragraph. |
| 146 | S9.4.1.2, Detailed System Description | Inserted “The layout of the CRHA envelope is shown in Figure 1.2-3.” in first paragraph. |
| 147 | S9.4.1.2, Detailed System Description | Inserted associated Room numbers corresponding to the rooms that comprise the CRHA envelope as part of response to RAI 9.4-8. |

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|-------------|--|--|
| 148 | S9.4.1.2, Detailed System Description | Revised to state "...SBO or a high radiation condition with or without AC power." in paragraph after bulleted list of rooms |
| 149 | S9.4.1.2, Detailed System Description | Inserted "The EFUs will be monitored by instrumentation that will detect a loss of airflow and will detect radiation downstream of the EFU filters. Upon such detection, the CRHA envelope is isolated and EBAS is automatically actuated." at end of paragraph starting with "The EFU consists of an ..." |
| 150 | S9.4.1.2, Detailed System Description | Revised paragraph starting with "The MCR recirculation AHUs provide ..." to state "...when the CRHA envelope is isolated. The MCR recirculation AHUs are battery powered during the first two hours of an SBO. With AC power available, the MCR recirculation AHUs operate beyond the first two hours of a CRHA isolation event. This nonsafety-related system automatically starts and removes heat generated from nonsafety-related heat rejection loads that are only energized during the first two hours of the SBO. If the MCR..." |
| 151 | S9.4.1.2, Detailed System Description | Inserted new paragraph "The capability to manually actuate the MCR recirculating AHUs is provided in the unlikely event that normal cooling is not available." immediately after paragraph starting with "The MCR recirculation AHUs provide ..." |
| 152 | S9.4.1.2, Detailed System Description | Revised EBAS description to state "The EBAS provides sufficient breathing quality air to maintain positive pressure in the CRHA when the CRHA envelope is isolated. The EBAS system is automatically actuated when the CRHA envelope is isolated. Controls to manually isolate the CRHA envelope and to manually actuate EBAS are also provided." |

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| Item | Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure) | Description of Change |
|-------------|--|--|
| 153 | S9.4.1.2, System Operation | Revised first paragraph to state "...EBAS and the CRHAVS isolation dampers. During an SBO or an event that causes isolation of the CRHA envelope, the CRHA isolation dampers automatically close and the EBAS is automatically actuated. Upon as isolation of the CRHA envelope EBAS operates for up to 72 hours. Also, the MCR recirculation AHUs/CDUs start upon the initiation of a CRHA isolation. The units operate for ..." |
| 154 | S9.4.1.2, System Operation | Inserted ". However, the MCR recirculating AHUs/CDUs are manually actuated in the unlikely event of a loss of normal cooling capability" under third bullet describing Normal Operating Mode. |
| 155 | S9.4.1.2, System Operation | Inserted "In the CBGAVS, smoke dampers are provided to prevent smoke and hot gases from migrating into other fire areas. Upon detection of smoke, the smoke dampers will automatically close and isolate the fire area in the CRHA and general areas of the Control Building" under second bullet describing Fire/Smoke Operating Mode per response to RAI 9.5-10 |
| 156 | S9.4.1.2, System Operation | Inserted "During this mode of operation the EFU is monitored for low airflow and for radiation downstream of the EFU filters. Should either of these conditions be detected, the CRHA envelope is automatically isolated and EBAS is automatically actuated to supply breathing air and pressurization to the CRHA envelope. Also, due to the CRHA isolation, the MCR recirculation AHUs and CDUs automatically start; the EFU fans and the normal supply and return fans are automatically stopped and the restroom fans are manually stopped" under Radiological Event Operation, first bullet |
| 157 | S9.4.1.2, System Operation | Inserted "alone, the CRHA envelope is automatically isolated and"; "and pressurization"; "all"; "(SBO)"; and "and automatically actuate EBAS" under Radiological Event Operation, second bullet |

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|-------------|--|---|
| 158 | S9.4.1.2, System Operation | Deleted “Toxic gas sensors are provided as required by site specific conditions” from Toxic Gas Mode Operation. See corresponding addition for Section 9.4.1.6. |
| 159 | S9.4.1.3 | Inserted “EBAS and associated instrumentation and controls”. |
| 160 | S9.4.1.4, second paragraph | Inserted “and associated instruments and controls”. |
| 161 | S9.4.1.4, third paragraph | Revised paragraph to reference AG-1 and N510 and delete reference to N509. Also corrected title of N510. |
| 162 | S9.4.1.5, fifth paragraph | Inserted “The CRHAVS EFUs have safety-related instrumentation and controls that detect low air flow and detect radiation downstream of the EFUs. Such detection will initiate an isolation of the CRHA envelope.” |
| 163 | S9.4.1.6 (new) | Inserted Section “COL Information” with text “The COL Applicant is responsible for defining site adequacy in regard to neighboring toxic or hazardous materials shipping and handling. If no toxic gas threats are present, references to toxic gas detectors will be revised.” |
| 164 | S9.4.1.7 (new) | Inserted Section “9.4.1.7 References” as part of incorporating the response to RAI-9.4-5 |
| 165 | S9.4.2 throughout including Tables 9.4-3 and 9.4-4 and Figures 9.4-5 and 9.4-6 | Changed acronyms FBHV to FBVS FBGAHV to FBGAVS FBFPHV to FBFPVS throughout the section. (editorial & non-technical to maintain consistency) |
| 166 | S9.4.2.1, Power Generation Design Basis | Added new sixth bullet: “Smoke control in accordance with NFPA 92A is provided for unsprinklered areas where the Fire Hazards Analysis identifies a potential for heavy smoke or heat conditions.” per RAI 9.5-11 response. |

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|-------------|--|---|
| 167 | S9.4.2.1, Power Generation Design Basis, Compliance to GDC 60 and 61 | Changed the following sentence in two places because Reg. Guide 1.140 is specific to testing. The latest version of ASME AG-1 will govern design and maintenance: “The Reactor Building HVAC Purge Exhaust Filter Unit is tested in accordance with Regulatory Guide 1.140.” |
| 168 | S9.4.2.4, new last paragraph | Added “The Reactor Building HVAC Purge Exhaust Filter Unit is tested in accordance with Regulatory Guide 1.140” per response to RAI 9.4-14 |
| 169 | S9.4.2.6 and S9.4.2.7 | <p>Added new sections:</p> <p>9.4.2.6 COL Information None</p> <p>9.4.2.7 References</p> <p>9.4.2.7-1 Regulatory Guide 1.29, "Seismic Design Classification" (see Table 1.9-21)</p> <p>9.4.2.7-2 Regulatory Guide 1.140, "Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants" (see Table 1.9-21)</p> <p>9.4.2.7-3 IEEE-338, "Standard Criteria for the Periodic Surveillance Testing of Nuclear Power Generating Station Safety Systems" (see Table 1.9-22)</p> <p>9.4.2.7-4 NUREG-0800, Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants, Section 9.4.2, "Spent Fuel Pool Area Ventilation System" (see Table 1.9-20)</p> |
| 170 | S9.4.3 throughout including Tables 9.4-6 and 9.4-7 and Figure 9.4-7 | <p>Changed acronyms</p> <p>RWBHV to RWVS</p> <p>RWBCR to RWCR</p> <p>RWBGA to RWGA</p> <p>new - RWCRVS</p> <p>new - RWGAVS</p> <p>throughout the section. (editorial & non-technical to maintain consistency)</p> |

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|-------------|--|--|
| 171 | S9.4.3.1, RWGAVS | Added “Smoke control in accordance with NFPA 92A is provided for unsprinklered areas where the Fire Hazards Analysis identifies a potential for heavy smoke or heat conditions.” as new eighth bullet per response to RAI 9.5-11 |
| 172 | S9.4.3.4, second paragraph | <p>After: Regulatory Guide 1.140, changed: “ Nuclear Air and Gas Treatment.”</p> <p>To: “Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants.”</p> <p>The above is a non-technical change to the Reg. Guide Title, which satisfies RAI 9.4-20.</p> |
| 173 | S9.4.3.6 and S9.4.3.7 | <p>Added new sections:</p> <p>9.4.3.6 COL Unit-Specific Information</p> <p>The major equipment data and system design parameters are site dependent and are shown in Table 9.4-6 and 9.4-7.</p> <p>9.4.3.7 References</p> <p>9.4.3-1 Regulatory Guide 1.29, Seismic Design Classification (see Table 1.9-21)</p> <p>9.4.3-2 Regulatory Guide 1.140, Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plant (see Table 1.9-21)</p> |
| 174 | S9.4.4 throughout including Figure 9.4-8 | Changed acronym TBHV system to TBVS throughout the section. (editorial and non-technical to maintain consistency) |
| 175 | S9.4.4.1, Power Generation Design Basis | Removed: “by exhausting air, through filters from the areas in which a significant potential for contamination exists” |

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|-------------|--|---|
| 176 | S9.4.4.1, Power Generation Design Basis | Added new bullet per response to RAI 9.5-11: <ul style="list-style-type: none"> • Smoke control in accordance with NFPA 92A is provided for unsprinklered areas where the Fire Hazards Analysis identifies a potential for heavy smoke or heat conditions” |
| 177 | S9.4.4.1, Power Generation Design Basis | Added two new bullets: <ul style="list-style-type: none"> • Maintains the Turbine Building minimum required exhaust capability, as well as the fan coil units of the Reactor Component Cooling Water System (RCCWS), Nuclear Island subsystem of the Chilled Water System (CWS) and Instrument Air System (IAS) rooms in operation during Loss of Preferred Power (LOPP) • Provides an adequate level of a minimum of 50% standby cooling capacity in areas where loss of cooling could cause degraded equipment performance” |
| 178 | S9.4.4.1, Power Generation Design Basis | Changed paragraph after above bullets to read as follows:: “Regarding the ESBWR nonsafety-related TBVS, this subsection addresses or refers to other locations that address the applicable requirements of the General Design Criteria (GDC) 2, 5 and 60, discussed in Standard Review Plan (SRP) 9.4.4 (Table 1.9-20).” |
| 179 | S9.4.4.1, Power Generation Design Basis | Added references: “(Table 1.9-21)” after Regulatory Guide 1.29 in last bulleted list. |
| 180 | S9.4.4.2, Detailed System Description | Corrected “high efficiency particulate adsorber” to “high efficiency particulate air” for HEPA definition under subsection for Turbine Building Decontamination Room Exhaust (TBDRE) Subsystem. |
| 181 | S9.4.4.2, Loss of Preferred Outside Power | Revised subsection title to read: "Loss of Preferred Power (LOPP)" |

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|-------------|--|---|
| 182 | S9.4.4.4, third paragraph | <p>Changed paragraph to read: “TBVS filtration components, are periodically tested in accordance with Regulatory Guide 1.140 “Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants.” (per RAIs 9.4-14 and 9.4-20)</p> |
| 183 | S9.4.4.6 and S9.4.4.7 | <p>Added the following sections: 9.4.4.6 COL Unit-Specific Information The major equipment data and system design parameters are site-dependent and are shown in Table 9.4-15. 9.4.4.7 References 9.4.4-1 Regulatory Guide 1.29, "Seismic Design Classification" (see Table 1.9-21) 9.4.4-2 Regulatory Guide 1.140, "Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plant" (see Table 1.9-21)</p> |
| 184 | S9.4.6 throughout including Table 9.4-8 | <p>Changed acronym RBHVS to RBVS throughout the section. (editorial and non-technical to maintain consistency)</p> |
| 185 | S9.4.6.1, Power Generation Design Basis | <p>Added new bullets per RAIs 9.5-10 and 9.5-11:</p> <ul style="list-style-type: none"> • Prevents smoke and hot gases from migrating into other fire areas by automatically closing smoke dampers upon detection of smoke. • Smoke control in accordance with NFPA 92A is provided for unsprinklered areas where the Fire Hazards Analysis identifies a potential for heavy smoke or heat conditions. |

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| Item | Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure) | Description of Change |
|-------------|--|---|
| 186 | S9.4.6.4, second paragraph | Revised paragraph to read: “The Reactor Building HVAC purge exhaust filter components are periodically tested in accordance with Regulatory Guide 1.140, Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plants.” Deleted reference to ANSI/ASME N509 and specific HEPA testing methodology. Changes are per RAIs 9.4-14 and 9.4-20 |
| 187 | New Sections 9.4.6.6 and 9.4.6.7 | Added the following new sections: 9.4.6.6 COL Information None. 9.4.6.7 References 9.4.6-1 Regulatory Guide 1.29, Seismic Design Classification (see Table 1.9-21) 9.4.6-2 Regulatory Guide 1.140, Design, Inspection, and Testing Criteria for Air Filtration and Adsorption Units of Normal Atmosphere Cleanup Systems in Light-Water-Cooled Nuclear Power Plant (see Table 1.9-21) |
| 188 | S9.4.7, Generic | Replaced EBHV with EBVS, added EERVS, TSCVS and DGVS acronyms for the associated sub-systems. |
| 189 | S9.4.7.1, Power Generation Design Basis | Added new bullet per RAI 9.5-11: “Smoke control in accordance with NFPA 92A is provided for unsprinklered areas where the Fire Hazards Analysis identifies a potential for heavy smoke or heat conditions.” |
| 190 | S9.4.7.1, Power Generation Design Basis | Under TSCVS, removed “site specific” from the toxic gas discussion in the third bullet |
| 191 | S9.4.7.2, System Operation, Normal Operation Mode | Under EERVS, added “supply” and “return/exhaust” in the second and fourth sentences of first paragraph to clarify which fans are being discussed. |
| 192 | S9.4.7.2, System Operation, Normal Operation Mode | Under TSCVS, added “The TSC HVAC Subsystem automatically switches to the recirculation mode if toxic gases or smoke are detected in the outside intake air.” to the end of the second paragraph. |

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|-------------|--|---|
| 193 | S9.4.7.2, System Operation, Normal Operation Mode | Under DGVS, changed “if required” to “when required”. |
| 194 | S9.4.7.4 | Revised last paragraph to remove reference to N509 (n/a for periodic filter testing), added reference ASME AG-1, and corrected title of ASME N510, per response to RAI 9.4-14 |
| 195 | S9.4.7.6 | Added new COL Information section with following text: "The major equipment data and system design parameters are site dependent." |
| 196 | S9.4.7.7 | Added new References section per response to RAI 9.4-5 with following entries: 9.4.7-1 ASME AG-1, "Code on Nuclear Air and Gas Treatment" (see Table 1.9-22) 9.4.7-2 ASME N510, "Testing of Nuclear Air Treatment Systems" (see Table 1.9-22) |
| 197 | S9.4.8.1, Power Generation Design Basis | Added “Loss of Preferred Power” in the first location of LOPP and added reference to Tables 9.4-13 and 9.4-14 for DCS design parameters. |
| 198 | S9.4.8.6 | Add new Subsection 9.4.8.6 “COL Unit-Specific Information” with contents: "None." |
| 199 | S9.4.8.7 | Add new Subsection 9.4.8.7 “References” with contents: 9.4.8-1 Regulatory Guide 1.29, "Seismic Design Classification (see Table 1.9-21)" |
| 200 | S9.4.9.2, Detailed System Description | Added “nitrogen” to first sentence to delineate the liquid stored. |
| 201 | S9.4.9.2, Detailed System Description | Revised “pressure reducing valve” to “control valve” in second and third paragraphs. |
| 202 | S9.4.9.2, Detailed System Description | Added “The Reactor Building HVAC system is discussed in Subsection 9.4.6.”to end of fourth paragraph. |

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| Item | Location (e.g., subsection with paragraph/sentence/item, table with column/row, or figure) | Description of Change |
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| 203 | S9.4.9.2, Detailed System Description | Added “(see Subsection 9.3.8)” and deleted “This line is used for the initial HPNSS charging and makeup to maintain the ADS SRV and Inboard MSIV accumulators charged with nitrogen during normal plant operation” at end of seventh paragraph. |
| 204 | S9.4.9.6 (new) | Added COL Information Section. Contents: "None." |
| 205 | S9.4.9.7 (new) | Added References Section. Contents: "None." |
| 206 | S9.4.10 (deleted) | This section removed as each subsection now has a COL Information section |
| 207 | S9.4.11 (deleted) | This section removed as each subsection now has a References section |
| 208 | Table 9.4-1 | Corrected “40.0°C (-40°F)” to “-40.0°C (-40°F)” for 0% exceedance winter value. |
| 209 | Table 9.4-1 | Revised DCIS Rooms/Miscellaneous areas Design Conditions from 22.8°C to 18.3°C to match the System Design Specification, added “100 cfm” English units to EBAS supply capacity and Reference to ASHRAE 62 as the source for this flow capacity. |
| 210 | Table 9.4-1, EBAS | Added 0.125” w.g. equivalent pressure value for EBAS pressurization of 31 Pa |
| 211 | Table 9.4-1 | Relocated EBAS information from Table 9.4-2 |
| 212 | Table 9.4-2 | Relocated EBAS information to Table 9.4-1 |
| 213 | Table 9.4-2, CRHAVS EFU | Changed "medium efficiency filters" to "medium (40-45%) efficiency filters" |
| 214 | Table 9.4-2 | Added two new pages of data for various fans. |
| 215 | Tables 9.4-4 and 9.4-5 | Changed Tables 9.4-4 and 9.4-5 to correctly state the quantity of building supply and exhaust dampers from 1 to 2, and revised the ASME AG-1 Leakage class to simply refer to the leakage class rather than attempt to list the detailed leakage class requirements from the code. |

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| 216 | Table 9.4-8 | In two locations, changed pressurization to “-62 Pa (-0.25 in w.g.)”. Change editorial since the minus sign was missing in front of 62. Also change fraction -1/4 to decimal equivalent -0.25 for consistency with rest of table entries. |
| 217 | Table 9.4-9 | Made changes to Table 9.4-9: a. Revised Supply air handling units normal flow to 27,250 l/s (57,739 cfm) , Cooling capacity to 686,407 watts (2,344,203 Btu/h) and Heating capacity to 100,553 watts (343,406 Btu/h) . b. Revised AHU Supply fans normal flow to 27,250 l/s (57,739 cfm) . c. Revised Return/exhaust fans flow to 24,800 l/s (52,548 cfm) . d. Revised Smoke exhaust fans flow to 17,600 l/s (37,292 cfm) . |
| 218 | Tables 9.4-10 and 9.4-11 for Safety-Related building damper | In two locations under ASME AG-1 Seat Leakage Class: changed “0.44 liter/second per square meter (1 cubic foot per minute/square foot) at 250 Pascal differential pressure values” to “I - Low Leakage”. Editorial change to remove detailed information that is best referenced from the AG-1 code. |
| 219 | Table 9.4-11 | Added the following design information to Refueling Machine Control Room Recirculation AHU: Flow: 850 l/s (1800 cfm) Static Pressure: 125 Pa (0.5 in wg.) Cooling: 10,550 watts (Nominal 3 tons; 36,000 Btu/hr) AHU Drive Power: 0.75 kW (1 hp) Deleted: “* - To be provided by the COL applicant” from below table. |
| 220 | Table 9.4-13 | Under “Cooling capacity (each FCU)” changed from 1162 kW to 1408 kW for consistency with value in English units. Also clarified the footnote at the bottom of the table. |

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| 221 | Table 9.4-15 (new) | Added: Table 9.4-15 Design Parameters for TBVS |
| 222 | Table 9.4-16 (new) | Added Design Parameters Table for EBVS per response to RAI 9.4-8 |
| 223 | Figure 9.4-5 | Changed out incorrect figure (FBGAVS simplified system diagram) for correct one |
| 224 | S9.5.1.1, Power Generation Design Basis | Added "and will not significantly increase the risk of radioactive release to the environment" to end of third bullet. (Incorporated in response to RAI 9.5-5) |
| 225 | S9.5.1.1, Power Generation Design Basis | Added third bullet to second grouping of bullets that reads as follows: "To maintain the ability to minimize the potential for radioactive releases to the environment in the event of a fire." (Incorporated in response to RAI 9.5-6) |
| 226 | S9.5.1.1, Power Generation Design Basis | Added "as required by the Fire Hazards Analysis" to the second bullet of the third grouping of bullets in this section. (Incorporated in response to RAI 9.5-7) |
| 227 | S9.5.1.1, Power Generation Design Basis | Changed "Cleaning" to "Cooling" in next to last bullet of section for consistency with the official definition of FAPCS. |
| 228 | S9.5.1.2, fourth paragraph | Changed paragraph to read: "An automatic fire detection, alarm, supervisory control, and indication system is also provided in selected areas of the plant, as required by the fire hazards analysis for personnel safety and fire brigade notification." (Incorporated in response to RAI 9.5-7) |

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| 229 | S9.5.1.3 | <p>Replaced "Safety-related cables conform to the IEEE-383 flame test" with "The acceptance criterion is that a single fire cannot degrade the performance of more than one division of safe shutdown equipment controlled from the main control room. However, if alternate means of control or indication are provided or available that remain unaffected by the same fire, then exception to the BTP SPLB 9.5-1 requirements for circuit routing and separation may be taken. The alternate means of control or indication are not required to be safety-related. All electrical cables (safety-related and nonsafety-related) conform to IEEE-1202 flame test criteria." (Incorporated in response to RAIs 9.5-8 and 9.5-9)</p> <p>Added new paragraph "The intent is to avoid the use of electrical raceway fire barrier systems (ERFBS) for ESBWR, relying instead on divisional separation by fire area and structural fire barriers." (Incorporated in response to RAI 9.5-22)</p> |
| 230 | S9.5.1.6 | <p>Editorial change. Changed all fractional dimensions in section to decimal format (e.g., changed "2 1/2 inch" to "2.5 inch", etc.).</p> |
| 231 | S9.5.1.11 | <p>Inserted "Smoke control in accordance with NFPA 92A is provided for unsprinklered areas where the Fire Hazards Analysis identifies a potential for heavy smoke or heat conditions." as new first paragraph in section. (Incorporated in response to RAI 9.5-11)</p> |
| 232 | S9.5.1.11 | <p>Editorial – revised acronyms as follows:</p> <ul style="list-style-type: none"> CBHVS changed to CBVS CRHAHVS changed to CRHAVS CBGAHVS changed to CBGAVS RBHVS changed to RBVS <p>Added "HVAC" to title of "Control Room Habitability Area HVAC Subsystem (CRHAVS)" subsection.</p> |

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| 233 | S9.5.1.11, Control Room (CB) Smoke Removal | Added following to end of section: "Fire-rated penetration seals and smoke dampers are provided to prevent smoke and hot gases from migrating into other fire areas." (Incorporated in response to RAI 9.5-10) |
| 234 | S9.5.1.12.1.1, S9.5.1.12.1.2 and S9.5.1.12.1.3 | Added ", unless identified as a significant fire hazard in the Fire Hazards Analysis" to end of third paragraph in each section. (Incorporated in response to RAIs 9.5-12 through 9.5-14) |
| 235 | S9.5.2 | General change in section. Changed section title to "Communication System" and redefined its parts as subsystems. |
| 236 | S9.5.2 | Added following to end of introductory statement: "during normal, maintenance, transient, fire, and accident conditions under maximum potential noise levels. The communication system consists of the following subsystems: <ul style="list-style-type: none"> • Plant page/party-line (PA/PL) subsystem • Private automatic branch exchange (PABX) subsystem • Plant sound-powered telephone subsystem • Plant radio subsystem • Evacuation alarm and remote warning subsystem • Emergency offsite communication subsystem" |
| 237 | S9.5.2.1, Safety Design Basis | Changed text to read: "The communication system serves no safety-related function and is therefore nonsafety-related." |

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|-------------|--|---|
| 238 | S9.5.2.1, Power Generation Design Basis | Revised first two bullets to read: <ul style="list-style-type: none"> • Communication subsystems are independent of one another, therefore, a failure in one subsystem does not degrade the performance of the other subsystems. • The communication system is in accordance with applicable codes and standards and the equipment is shielded as necessary, from the adverse effects of electromagnetic interference (EMI) and radio frequency interference (RFI). |
| 239 | S9.5.2.2, Summary | Clarified that the TSC connects to the Non-Essential DCIS in third paragraph. Updated cross reference in fourth paragraph to read "Subsection 9.5.2.5" |
| 240 | S9.5.2.2, In-Plant Page/Party Line (PA/PL) | Third paragraph – changed "5-channel" to "multiple-channel". |
| 241 | S9.5.2.2, In-Plant Page/Party Line (PA/PL) | Third paragraph after bulleted list – Deleted reference to 480 VAC power. Fifth paragraph after bulleted list – Deleted last sentence about volume settings. Next to last paragraph – Deleted output values for speakers. Last paragraph – Deleted "Wiring is routed in dedicated conduits." |
| 242 | S9.5.2.2, Plant Radio System | First paragraph – Changed third sentence to read: "Lower power portable radios are used with this system to ensure that there is no EMI with control and instrument circuits." Third paragraph – Changed "eight channels" to "multiple channels". Deleted "Security" from bulleted list. |
| 243 | S9.5.2.2, Emergency Communication Systems | Deleted first bullet discussing security radio system. Replaced two paragraphs discussing security radio system with "The emergency offsite communication system, including the crisis management radio system, will be addressed by the COL applicant." |
| 244 | S9.5.2.3 | Changed "nuclear safety-related" to "safety-related" for procedural compliance. |

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| 245 | S9.5.2.5 (new) | <p>Inserted new COL Unit Specific Information section as follows:</p> <p>The COL applicant shall specify the Security Communication System Design.</p> <p>The Emergency Response Data System, including the emergency offsite communications system, shall be addressed by the COL applicant.</p> <p>The COL applicant shall comply with the requirement of IE Bulletin 80-15 for the Emergency Notification System.</p> |
| 246 | S9.5.2.6 (new) | Inserted new references section with 10 items. |
| 247 | S9.5.3 | Changed last sentence of introductory paragraph to read: "These systems include normal, standby, emergency and security lighting subsystems. Security lighting system is described in separate security documents. Refer to Section 13.6." |
| 248 | S9.5.3.1 | Empty section deleted. Subsequent sections renumbered. |
| 249 | S9.5.3.3 (now 9.5.3.2) | <p>Turned items into bulleted list. Changed "as much as" to "to the extent" in third bullet. Added two new bulleted items to list:</p> <ul style="list-style-type: none"> • Mercury vapor lamps and mercury switches are not used in fuel handling areas. • Incandescent lamps are the only type of lamp used within the primary containment, the main steam tunnel, and the refueling level of the Reactor Building. |
| 250 | S9.5.3.3 (now 9.5.3.2) | All subsections (Normal Lighting Design Bases, Standby Lighting Design Bases, etc.) deleted. |
| 251 | S9.5.3.4 (now 9.5.3.3) | Major revision that deleted most of previous text. |
| 252 | S9.5.3.4, Normal Lighting System Description (now S9.5.3.3.1) | Inserted new first paragraph: "The normal lighting system, as supplemented by the standby lighting system, is used to provide normal illumination under normal plant operating, maintenance, and testing conditions." Deleted last two paragraphs. |

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| 253 | S9.5.3.4, Standby Lighting System Description (now S9.5.3.3.2) | Inserted new first paragraph: "The standby lighting system, in addition to supplementing the normal lighting system, supplements the emergency lighting system in selected areas of the plant where emergency operations are performed, including the access and egress routes to and from those areas." Deleted paragraph near end starting with "The circuits to the individual ..." |
| 254 | S9.5.3.4, Emergency Lighting System Description (now S9.5.3.3.3) | Inserted new first paragraph: "The emergency lighting system is used to provide acceptable levels of illumination throughout the station and, particularly, in areas where emergency operations are performed, such as control rooms, battery rooms, containment, etc., upon loss of the normal lighting system." Deleted first two paragraphs after bulleted list and final paragraph of section. |
| 255 | S9.5.3.4, Control Room Emergency Lighting (now S9.5.3.3.3.1) | Revised text to read: "The control room emergency lighting is integrated with the standby lighting that consists of identical lighting fixtures and is supplied from the four divisions of 72-hour Class 1E Uninterruptible AC power supply system (UPS). The 72-hour Class 1E batteries and the standby on-site AC power supply system provide backup to the 72-hour Class 1E UPS. The MCR emergency lighting complies with the human factor requirements by utilizing semi-indirect, low-glare lighting fixtures. The MCR emergency lighting is Class 1E Seismic Category I. Both the standby and emergency lighting fixtures, switches and associated cables used in the main control room are non-Class 1E." |

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| 256 | S9.5.3.4, DC Self-Contained Battery-Operated Lighting Units (now S9.5.3.3.2) | <p>Replaced first paragraph with:</p> <p>In areas outside the MCR and the remote shutdown area, emergency light is provided by 8-hour, self-contained, battery pack, sealed beam lighting units. These units are powered from the non-Class 1E and provide illumination for safe ingress and egress of personnel following a loss of normal lighting in following areas:</p> <ul style="list-style-type: none"> • Areas required for power restoration / recovery to comply with the requirement of BTP SPLB 9.5-1. Two-hour rated units as a minimum are used in other areas of the plant. • Areas where normal actions are required for operation of equipment needed during fire • Stairwells serving as escape or access routes for fire fighting. <p>Deleted last two sentences of final paragraph.</p> |
| 257 | S9.5.3.4, Emergency Lighting System Description | Deleted section in its entirety. |
| 258 | S9.5.3.6 (new) | Added new COL Unit Specific Information section. Contents: "The COL shall specify the Security Lighting System Design." |
| 259 | S9.5.3.7 (new) | <p>Added new References section with following items:</p> <p>9.5.3-1 Illuminating Engineering Society of North America (IESNA), IESNA Lighting Handbook (see Table 1.9-22).</p> <p>9.5.3-2 LTS-2, 1986 AASHTO, Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals.</p> |
| 260 | S9.5.4.2 | Moved COL Applicant information to 9.5.4.6. Updated a cross reference and added a cross reference to reflect new subsection for COL information. |
| 261 | S9.5.4.2 | Added "Loss of Preferred Power" in the first location of LOPP and changed "RG" to "Reg Guide" |

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| 262 | S9.5.4.4, third paragraph | Changed “ANSI/ASTM D975” to “ASTM D975”. |
| 263 | S9.5.4.4, third paragraph | Replaced “Fuel oil may be stored for a minimum of six months without deterioration” with “During storage, biocides and other fuel additives are added to the stored fuel oil to prevent deterioration, accumulation of sludge in the tank, and the growth of algae and fungi.” |
| 264 | S9.5.4.6 | Added new COL Information subsection. Contents: “The COL applicant shall specify the DG fuel oil system design up to the diesel engine skid.” |
| 265 | S9.5.4.7 | Added new References section. Contents: 9.5.4-1 Reg Guide 1.137, “Fuel-Oil Systems for Standby Diesel Generators” (see Table 1.9-21) 9.5.4-2 ASME Boiler and Pressure Vessel Code (B&PVC), “Section VIII – Rules for Construction of Nuclear Power Plant Components” (see Table 1.9-22) 9.5.4-3 ASME B31.1, “Power Piping” (see Table 1.9-22) 9.5.4-4 ASTM D975, “Standard Specification for Diesel Fuel Oils” (see Table 1.9-22) 9.5.4-5 ANS 59.51, “Fuel Oil Systems for Safety-Related Emergency Diesel-Generators” (see Table 1.9-22) 9.5.4-6 ASME Boiler and Pressure Vessel Code (B&PVC), “Section XI - Rules for Inservice Inspection of Nuclear Power Plant Components” (see Table 1.9-22) |
| 266 | S9.5.5.2, Summary Description | Changed “COL Applicant” to “diesel generator manufacturer”. Deleted cross reference to COL information subsection. |
| 267 | S9.5.5.2, Detailed System Design | Changed “Make Up Water System” to “Makeup Water System (MWS)”. |
| 268 | S9.5.5.2, System Operation | Changed “During the standby mode, the jacket water temperature is maintained at 48.9°C (120°F), based on 10°C (50°F) normal ambient temperature, by the heater.” to “During the standby mode, the jacket water is maintained within the temperatures specified by the DG manufacturer based on normal ambient temperature, by the heater”. |

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| 269 | S9.5.5.6 | Added new COL Information subsection. Contents: "None." |
| 270 | S9.5.5.7 | Added new "References" section. Contents: 9.5.5-1 ASME B31.1, "Power Piping" (see Table 1.9-22) |
| 271 | S9.5.6.2 | Changed "COL Applicant" to "diesel generator manufacturer". Deleted cross reference to COL information subsection. |
| 272 | S9.5.6.6 | Added new COL Information subsection. Contents: "None." |
| 273 | S9.5.6.7 | Added new "References" section. Contents: 9.5.6-1 ASME Boiler and Pressure Vessel Code (B&PVC), "Section VIII – Rules for Construction of Nuclear Power Plant Components" (see Table 1.9-22) 9.5.6-2 ASME B31.1, "Power Piping" (see Table 1.9-22) |
| 274 | S9.5.7.1, Power Generation Design Basis | Added "The DG lubrication system allows the DG to operate at full load for a minimum of 7 days." |
| 275 | S9.5.7.2, Summary Description | Changed "COL Applicant" to "diesel generator manufacturer". Deleted cross reference to COL information subsection. |
| 276 | S9.5.7.2, System Operation | Added "and back to the sump" after "circulating oil through the filters and manifold to the engine and generator bearing surfaces". |
| 277 | S9.5.7.6 | Added new COL Information subsection. Contents: "None." |
| 278 | S9.5.7.7 | Added new "References" section. Contents: 9.5.7-1 TEMA - Standards of Tubular Exchanger Manufacturers Association (see Table 1.9-22) 9.5.7-2 ASME Boiler and Pressure Vessel Code (B&PVC), "Section VIII – Rules for Construction of Nuclear Power Plant Components" (see Table 1.9-22) 9.5.7-3 ASME B31.1, "Power Piping" (see Table 1.9-22) |

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| 279 | S9.5.8.2, Summary Description | Changed "COL Applicant" to "diesel generator manufacturer". Deleted cross reference to COL information subsection. |
| 280 | S9.5.8.6 | Added new COL Information subsection. Contents: "None." |
| 281 | S9.5.8.7 | Added new "References" section. Contents: "None" |
| 282 | S9.5.9 and S9.5.10 | Deleted Subsections. The "COL Information" and "References" have been transferred to individual system Subsections 9.5.1 thru 9.5.8.. Basis for COL Information and References are covered in those individual subsections. |
| 283 | Table 9.5-2 | Added new note "****" to first three parameter values. Added note text as follows: "**** Based on the largest fire water demand of 967 m ³ /hr (4256 gpm) for Turbine Building, including hose stream." (Incorporated in response to RAI 9.5-15) |
| 284 | Table 9.5-2 | Added new requirement for fire water pumps: "Required minimum total makeup flow rate to IC/PCC and spent fuel pools at 72 hours into an event" with value "46 m ³ /hr (200 gpm)" (Incorporated in response to RAI 9.1-13 and the amended response to RAI 2.4-23) |
| 285 | Table 9.5-2 | Changed volume requirement for fire water storage tanks from "2081.8 m ³ (550,000 gallons)" to "3900 m ³ (1,030,000 gallons)". Changed "tank" to "tank(s)" to allow this volume to be achieved by use of more than one tank if deemed necessary to do so. (Incorporated in response to RAI 9.1-13 and the amended response to RAI 2.4-23) |
| 286 | Figure 9.5-4 | Deleted "Security System Power" and connected equipment. |
| 287 | Figure 9.5-5 | Minor editorial change to bus bar voltage at top of figure. Changed European format "13,8" to US format "13.8" |
| 288 | Figure 9.5-6 | Minor editorial change to bus bar voltage at top of figure. Changed European format "6,9" to US format "6.9" |
| 289 | Figure 9.5-7 | Added connections for Div 3 and Div 4 72-hour batteries. |
| 290 | Figure 9.5-8 | Deleted. |

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