Response to Action Item 19-19 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-19 (AI 19-19)

DCD Tier 2, Page 1.2-2 states: "The design target for CDF is 1E-5 events per reactor year, and the design target for LRF is 1E-6 events per reactor year. These targets include an assessment of internal and external events, excluding seismic events, sabotage, and other external events, and an assessment of shutdown events." However, in Chapter 19, the total CDF and LRF are estimated to be 7.7E-6/yr and 5.6E-7/yr, respectively, without seismic and other external events contributions and these design targets could be exceeded when including seismic risk and other external events risk.

Response

The PRA-based SMA methodology used satisfies the recommendation of SECY-93-087 approved by the NRC for a seismic risk evaluation. While quantitative results are not produced, this analysis ensures that the plant design is sufficiently robust to meet the design targets for CDF and LERF. COL 19.1(7) requires that the COL applicant "confirm that the PRA-based seismic margin assessment is bounding for the selected site, and to update the assessment to` include site-specific SSC and soil effects (including sliding, overturning liquefaction, and slope failure). The COL applicant is to confirm that the as-built plant has adequate seismic margin."

The "other external" events were subjected to a screening evaluation presented in Section 19.1.5.4 based on the process in the ASME/ANS Standard. This process, when applied in the design phase and COL phases ensures that the plant design is sufficiently robust to meet the design targets for CDF and LERF. It should be noted that the susceptibility to other external hazards is highly site-specific. COL 19.1(8) requires that the COL applicant addresses the non-screened events.

COL 19.1(7) and COL 19.1(8) in Section 19.1.9 are clarified as shown in Attachment.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Section 19.1.9 DCD Markup for Question PRA-19

19.1.9 Combined License Information

COL 19.1(7) The COL applicant is to confirm that the PRA-based seismic margin assessment is bounding for the selected site, and to update the assessment to include site-specific SSC and soil effects (including sliding, overturning liquefaction, and slope failure). The COL applicant is to confirm that the as-built plant has adequate seismic margin and do not exceed the CDF and LERF design targets specified in Subsection 1.2.1.1.1 e. See Subsection 19.1.5.1.2.

COL 19.1(8) The COL applicant needs to ensure that screened events do not have a site-specific susceptibility and do not exceed the CDF and LERF design targets specified in Subsection 1.2.1.1.1 e. The COL applicant is to address following issues with a site-specific risk assessment, as applicable:

- Dam failure
- External flooding
- Extreme winds and tornadoes
- Industrial or military facility
- Pipeline accident
- Release of chemicals from onsite storage
- River diversion
- Sandstorm
- Toxic gas
- Transportation accidents

See Subsection 19.1.5.4.

Response to Action Item 19-20 Section 1.9

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 1.9

Issue # PRA-20 (AI 19-20)

DCD Tier 2 Page 1.9-99, the term “Not applicable (COL)” is not defined.

Response

“Not applicable (COL)” has been replace with "This item is not applicable to the design certification phase, since it requires site specific information. This item will be addressed in the COL phase. See Subsection 19.1.9."

Item No. II.S in Table 1.9-7 (5 of 5) in Section 1.9 is clarified as shown in Attachment 1.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Table 1.9-7 (5 of 5)

Item No.	Title	Discussion
II.Q	Defense Against Common-Mode Failures in Digital Instrumentation and Control Systems	Addressed for the APR1400 in DCD Tier 2, Subsection 7.1.2.36, Table 7.1-1, and Subsections 7.3.2.4, 7.8.2.1, 7.8.2.2, and 7.8.2.3.
II.R	Steam Generator Tube Ruptures	Addressed for the APR1400 in DCD Tier 2, Subsection 15.6.3.
II.S	PRA Beyond Design Certification	~~Not applicable (COL)~~
II.T	Control Room Annunciator (Alarm) Reliability	Addressed for the APR1400 in DCD Tier 2, Subsection 7.1.2.37, Table 7.1-1, and Subsection 7.5.2.4.
III.E	Control Room Habitability	Not applicable
III.F	Radionuclide Attenuation	Not applicable

This item is not applicable to the design certification phase, since it requires site specific information. This item will be addressed in the COL phase. See Subsection 19.1.9.

Response to Action Item 19-22 Section 1.9

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 1.9

Issue # PRA-22 (AI 19-22)

DCD Chapter 1, Page 1.9-76, states that APR1400 conforms to SRP Section 19.1 “Determining the Technical Adequacy of Probabilistic Risk Assessment for Risk-Informed License Amendment Requests after Initial Fuel Load.” However, SRP Section 19.1 is only applicable to the amendment requests after initial fuel load.

Response

DCD Section 1.9, Page 1.9-76, is revised as shown on Attachment 1.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Table 1.9-2 (33 of 33)

SRP Section/Title	Revision / Issue Date	Conformance or Summary Description of Deviation	DCD Tier 2 Section
18.0 – Human Factors Engineering	Rev. 2 03/2007	The APR1400 conforms with this SRP.	Ch. 18
18-A –Guidance for Crediting Manual Operator Actions in Diversity and Defense-in-Depth (D3) Analyses	04/2014	The APR1400 conforms with this SRP.	18.6
19.0 – Probabilistic Risk Assessment and Severe Accident Evaluation for New Reactors	Rev. 2 06/2007	The APR1400 conforms with this SRP with exceptions. Note: SRP Acceptance Criteria for AP600 are out of the APR1400 scope.	19.1, 19.2
19.1 – Determining the Technical Adequacy of Probabilistic Risk Assessment for Risk-Informed License Amendment Requests after Initial Fuel Load	Rev. 3 09/2012	~~The APR1400 conforms with this SRP.~~	~~19.1~~
19.2 – Review of Risk Information Used to Support Permanent Plant-Specific Changes to the Licensing Basis: General Guidance	06/2007	Not applicable. This SRP section was written to address PRAs performed in support of changes proposed for existing, already-licensed plants.	N/A
19.4 – Strategies and Guidance to Address Loss-of-Large Areas of the Plant Due to Explosions and Fires	06/2014	The APR1400 conforms with this SRP.	19.4
19.5 – Adequacy of Design Features and Functional Capabilities Identified and Described for Withstanding Aircraft Impacts	04/2013	The APR1400 conforms with this SRP.	19.5

Only applicable to the License Amendment Requests after Initial Fuel Load.

N/A

Response to Action Item 19-27 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-27 (AI 19-27)

DCD Table 19.1-14 shows the basic event failure rate for I-ATWS-RPMCF as 2.98E-07 per day whereas NUREG/CR-6928 reports this failure rate as 2.98E-07 per hour. Does it affect the PRA?

Response

Type Code I-ATWS-RPMCF is used for failure to scram due to mechanical reasons. After the onset of the transient, if the control rods fail to insert, the event immediately becomes an ATWS event. Although the rods need to be inserted immediately, the mission time for I-ATWS-RPMCF was conservatively set to 1 hr.

This issue is a typographical error only. The Unit column for type code I-ATWS-RPMCF should be “h”, and not “d” in both DCD Tables 19.1-14 and 19.1-15 based on the cited reference in Table 19.1-14. This is a documentation issue as the PRA quantification database correctly incorporates this type code as an hourly failure rate.

The DCD will be revised to correct this typographical error by replacing the “d” in the “Unit” column with an “h” for type code I-ATWS-RPMCF in DCD Table 19.1-14 (See Attachment 1) and Table 19.1-15 (See Attachment 2).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment 1 – Table 19.1-14 DCD Markup for Question PRA-27

Table 19.1-14 (14 of 16)

Type Code[1]	Description	Unit	Mean	α	β	EF[2]	Distribution (Source)	Data Source[4]
DPTCA	Fail to Actuate (Open) of Trip Contractor for MG Set-X (DPS-X)	d	2.48E-05	0.50	2.01E+04	3.8	Beta	Table 7-14, RLY FTOP, All
I-ATWS-RPMCF	Failure to Scram due to Mechanical Failures	~~d~~h	2.98E-07	28.50	9.56E+07	1.3	Gamma	Table 8-6, ROD FTOP, ROD
--AIY	Failure of Analog Input Module	h	8.89E-06	-	-	2.8	Lognormal	Reference plant data
--BPT	Fail to Operate of RP Bi-stable Processor (PM646)	h	3.95E-06	-	-	2.8	Lognormal	Reference plant data
--CIY	Fail to Operate of Communication Module (CI631)	h	7.78E-07	-	-	2.8	Lognormal	Reference plant data
--CPT	Fail to Operate of Computational Module for LCL (PM646)	h	3.95E-06	-	-	2.8	Lognormal	Reference plant data
--DIY	Failure of Ovation Digital Input Module	h	2.65E-06	-	-	2.8	Lognormal	Reference plant data
--DOY	Failure of Ovation Digital Output Module	h	2.65E-06	-	-	2.8	Lognormal	Reference plant data
--GCT	Fail to Operate of ESFAS logic controller (PM646)	h	3.95E-06	-	-	2.8	Lognormal	Reference plant data

APR1400 DCD TIER 2

Attachment 2 – Table 19.1-15 DCD Markup for Question PRA-27

Table 19.1-15 (11 of 13)

Type Code	Description	Unit	Grouping	Equipment Boundary Definition
--XLY	Fails to Operate of Low Voltage Transformer	h	Transformers (480-120V)	Transformer unit including the wiring, cooling and protection equipment
--XMY	Fails to Operate of Medium Voltage Transformer	h	Transformers (4160-480V)	Transformer unit including the wiring, cooling and protection equipment
--XOY	Fails to Operate of Main Transformer	h	Main transformer	Transformer unit including the wiring, cooling and protection equipment
--XWA	Failure of Automatic Transfer Switch	d	Automatic/Manual transfer switch	Automatic/Manual transfer switch
--ZVO	Fail to Open of Power Operated Check Valve	h	Startup feedwater pump discharge stop check valve for FW system	Valve only
I-ATWS-RPMCF	Failure to Scram due to Mechanical Failures	~~d~~h	Control rod	Control rod excluding the drive mechanism
--AIY	Failure of Analog Input Module	h	Analog input modules for RPS/ESFAS and VU system	Analog Input Module
--BPT	Fail to Operate of RP Bi-stable Processor (PM646)	h	Bi-stables for RPS/ESFAS	Bistable processor
--CIT	Fail to Operate of Communication Module (CI631)	h	Communication modules for RPS/ESFAS	Communication module
--CPT	Fail to Operate of RP LCL Processor (PM646)	h	LCL processors	LCL processor
--DIY	Failure of Digital Input Module	h	Digital input modules for RPS/ESFAS	Digital input module
--DOY	Failure of Digital Output Module	h	Digital output modules for RPS/ESFAS	Digital output module

Response to Action Item 19-29 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-29 (AI 19-29)

Section 19.1.4.1.1.1, it is unclear whether any other references are used to calculate IE frequencies apart from NUREG/CR-6928.

Response

The source/reference for all internal events IE frequencies are contained in Table 19.1-6. The paragraph associated with this question is revised in the DCD to state this (see Attachment 1).

Reactor Vessel Rupture (RVR) IE frequency was taken from NUREG-1829, Volume 1, Table 7.19, for break sizes > 31 inches; however, Note (4) of Table 19.1-6 of the DCD states that this is Reference 52. Note that Reference 52 of Section 19 of the DCD is not NUREG-1829; in fact, NUREG-1829 was not listed in the references section. Therefore, NUREG-1829 will be added as reference 54 in Section 19.1.10 of the DCD (See Attachment 2), and Note (4) of Table 19.1-6 of the DCD will be updated to reflect the correct reference number (i.e., Reference 54) for RVR IE frequency (See Attachment 3).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment 1 – Section 19.1.4.1.1.1 DCD Markup for Question PRA-29

[Paragraph 8 of Section 19.1.4.1.1.1, top of page 19.1-37]

As these initiating events are similar to those of existing nuclear power plants, the frequency for each initiating event is calculated based on ~~generic~~ estimates for current power plants from generic references ~~such as NUREG/CR-6928 (Reference 11)~~, or from calculations (see Table 19.1-6 for specific sources).

Attachment 2 – Section 19.1.10 DCD Markup for Question PRA-29

[Page 19.1-240]

42. NUREG-1921, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines," U.S. Nuclear Regulatory Commission, November 2009.

43. EPRI 1016735, "Fire PRA Methods Enhancements: Additions, Clarifications, and Refinements to EPRI 1019189," Electric Power Research Institute, December 2008.

44. NUREG/CR-4527, "An Experimental Investigation of Internally Ignited Fires in Nuclear Power Plant Control Cabinets, Part II: Room Effects Tests," U.S. Nuclear Regulatory Commission, April 1987.

45. Regulatory Guide 1.102, "Flood Protection for Nuclear Power Plants," U.S. Nuclear Regulatory Commission, September 1976.

46. EPRI 1021086, "Pipe Rupture Frequencies for Internal Flooding Probabilistic Risk Assessments (PRAs)," Electric Power Research Institute, October 2010.

47. NUREG/CR-6144 (BNL-NUREG-52399), "Evaluation of Potential Severe Accidents During Low Power and Shutdown Operations at Surry, Unit 1," U.S. Nuclear Regulatory Commission, June 1994.

48. Inspection Manual Chapter 0609, Appendix G, "Shutdown Operations Significance Determination Process," U.S. Nuclear Regulatory Commission, February 2005.

49. NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Nuclear Energy Institute, July 2000.

50. NEI 00-04, "10 CFR 50.69 SSC Categorization Guideline," Rev. 0, Nuclear Energy Institute, July 2005.

51. CAFTA 6.0b, Software Manual, EPRI, Palo Alto, CA, 2014.

52. NUREG/CR-7114, "A Framework for Low Power/Shutdown Fire PRA," U.S. Nuclear Regulatory Commission, September 2013.

53. NUREG/CR-7150, "Joint Assessment of Cable Damage and Quantification of Effects from Fire (JACQUE-FIRE)," May 2014.

54. NUREG-1829, "Estimating Loss-of-Coolant Accident (LOCA) Frequencies Through the Elicitation Process," Main Report, Volume 1, April 2008.

APR1400 DCD TIER 2

Attachment 3 – Table 19.1-6 DCD Markup for Question PRA-29

Table 19.1-6 (2 of 2)

Designator	Initiating Event Description	Mean Frequency (Per Rx Critical Year)(1)	Mean Frequency (Per Rx Calendar Year)(2)	Error Factor
LOOP-WE	Weather-related	3.91E-03	3.71E-03	1.7
SBO	Station Blackout	Transferred from LOOP Event Tree		1.7
LOIA(3)	Loss of Instrument Air System	2.48E-02	2.69E-02	2.1
TLOCCW(3)	Total Loss of Component Cooling Water System	2.46E-04	2.34E-04	8.4
PLOCCW(3)	Partial Loss of Component Cooling Water System	4.59E-03	4.36E-03	2.0
TLOESW(3)	Total Loss of Essential Service Water System	2.46E-04	2.34E-04	8.4
PLOESW(3)	Partial Loss of Essential Service Water System	1.72E-3	2.52E-03	2.6
RVR(4)	Reactor Vessel Rupture	3.22E-08	3.06E-08	67.5
ISLOCA(5)	Interfacing System Loss of Coolant Accident	1.24E-10	1.18E-10	10.0

(1) The mean frequencies for these initiating events are values presented in Reference 11 in units of per reactor critical year (rcry). (Excludes frequencies for ISLOCA, and reactor vessel rupture, which a separately calculated.)

(2) The mean frequencies for these initiating events were adjusted to an APR1400 specific per reactor calendar year (rcy). Converting to APR1400 specific reactor calendar year (rcy), it was assumed the reactor is critical 95% of the year.
Converting to rcy, the result is:
(Mean Initiating Event Frequency/rcry) × (0.95 rcry/rcy) = Mean Initiating Event Frequency/rcy

(3) APR1400 LOCA break size from generic industry data. These LOCA initiating event frequencies are used as an estimate for APR1400 LOCA frequencies. Support system initiating event frequencies (/rcry) for LOIA, TLOCCW, PLOCCW, TLOESW, and PLOESW are calculated using fault trees in the initiating event analysis for information purposes. However, industry values for these parameters are utilized in the quantified PRA model.

(4) Reactor Vessel Rupture frequency (2.90E-08/rcy) was taken from NUREG-1829, Volume 1, Table 7.19, for break sizes > 31 inches (Reference ~~52~~54). This value was treated similarly to other LOCA frequencies, converting to per reactor critical year by multiplying by 1 rcy/0.9 rcry.

(5) The ISLOCA initiating event frequency (/rcy) is taken from calculation. No Error Factor (EF) is calculated for this initiating event frequency and thus an EF of 10 is assumed.

Response to Action Item 19-30 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-30 (AI 19-30)

Section 19.1.4.1.1.2, the staff could find no evaluation of plant response and how it was performed.

Response

Section 19.1.4.1.1.2 of the DCD describes this at a high level. Details of this analysis for each initiating event are contained in the Accident Sequence Analysis notebook, APR1400-K-P-NR-013102-P. However, the DCD is updated to state that the accident sequence analysis is consistent with the methodologies presented in NUREG/CR-2300.

See Attachment of the response to Issue # PRA-71 (AI 19-71).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Response to Action Item 19-31 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-31 (AI 19-31)

Section 19.1.4.1.1.2, in the RCS heat removal section, the word "may" is used for the feed and bleed operation. It is unclear whether which situations are considered and what they are.

Response

Section 19.1.4.1.1.2 e. of the DCD is revised to state: "This function can be achieved via secondary heat removal by relieving steam and injecting feedwater into the SGs. If secondary heat removal fails, RCS heat removal via primary feed and bleed can be used to perform this function." (See Attachment).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Attachment – Section 19.1.4.1.1.2 DCD Markup for Question PRA-31

[Section 19.1.4.1.1.2, page 19.1-39]

core and the RCS. Failure to control reactivity may cause core power generation to exceed the plant's capacity to remove it. Failure to limit core power may also challenge RCS integrity, depending on how well the other functions are performed.

b. RCS pressure control – This function is necessary to provide reasonable assurance that RCS design pressures are not exceeded during certain events (such as an ATWS or a loss of all secondary heat removal). RCS depressurization capability must also be provided to allow the use of the ECCS systems for non-LOCA events and to limit primary-to-secondary leakage after SGTR.

c. Preservation of RCS integrity – This function is closely related to the RCS pressure control function (i.e., if pressure control is not provided, then integrity cannot be maintained). Failure of the RCS integrity function can occur if the RCS pressure control features fail to reisolate the RCS after pressure relief was actuated following an initiating event. For example, if the POSRV failed to reseat following a demand, then RCS integrity would be compromised. RCS integrity will also be compromised if a LOCA occurs.

d. RCS inventory control – This function is crucial for maintaining core heat removal, since core damage is assumed to occur for any significant duration of core uncovery. Inventory control is of particular concern during LOCA events; however, inventory loss can also occur in other accident scenarios that result in an induced LOCA.

e. RCS heat removal – This function can be achieved ~~by~~ via secondary heat removal ~~to~~by ~~-~~relievinge steam and injecting feedwater into the SGs. If secondary heat removal fails, RCS heat removal via primary~~The~~ feed and bleed ~~operation may~~can be ~~able~~ used to perform this function.

f. Containment heat removal – This function is needed in those scenarios in which RCS heat is transferred to the containment, either due to a LOCA or due to use of the POSRVs.

For each initiating event, progression of potential scenarios leading to either a safe state or to core damage is modeled using an event tree. Functions required for mitigating the accident and for preventing core damage are included across the top of the event tree. Fault trees are used to quantify the probability of failure of each of the functions.

Response to Action Item 19-32 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-32 (AI 19-32)

Section 19.1.4.1.1.3, it is unclear what is meant by "based on the ASME standard."

Response

The first sentence under this section is revised to state: "The approach used in this success criteria analysis is designed to address the supporting requirements of the ASME/ANS PRA Standard (Reference 2) for the success criteria technical element." (See Attachment).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Section 19.1.4.1.1.3 DCD Markup for Question PRA-32

[Section 19.1.4.1.1.3, bottom of page 19.1-40]

19.1.4.1.1.3 Success Criteria Analysis

The approach used in this success criteria analysis is designed to address the supporting requirements of~~based on~~ the ASME/ANS PRA Standard (Reference 2) for the success criteria technical element~~requirements~~. The technical portions of the success criteria determination are based on the following:

Response to Action Item 19-33 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-33 (AI 19-33)

Section 19.1.4.1.1.3, it is unclear which success criteria were performed using RELAP and which ones were not.

Response

Both RELAP and MAAP were used. Section 19.1.4.1.1.7 states that RELAP5 code is used to analyze the thermal-hydraulic behavior of the plant, and MAAP code is used to evaluate the success criteria. The thermal-hydraulic analysis is used to determine the success criteria. Hence, both RELAP and MAAP were used to determine the success criteria.

At-power Success Criteria Analysis notebook (APR1400-K-P-NR-013103-P) identifies the use of RELAP for 12 Large LOCA scenarios, 8 Medium LOCA, 13 Small LOCA, and 4 SGTR scenarios. See Tables 5-1 and 5-3 in the Success Criteria Analysis notebook for additional details.

DCD Table 19.1-12 provides a summary of success criteria evaluated with RELAP, and Table 19.1-13 provides a summary of the success criteria evaluated with MAAP.

Section 19.1.4.1.1.3 is revised as shown in Attachment.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Section 19.1.4.1.1.3 DCD Markup for Question PRA-33

[Section 19.1.4.1.1.3 j., page 19.1-43 and 44]

j. The analysis model and computer codes

The MAAP 4.0.8 code, the RELAP5 code, as well as analysis results described in Chapter 15 of this submittal are used to determine success criteria. It is recognized that the RELAP5 code modeling is more detailed than the MAAP code modeling. However, the MAAP code can be used to model certain phenomenology that RELAP 5 cannot (e.g., containment performance and post-core damage phenomenology cannot be modeled with the RELAP5 code). Therefore, both RELAP5 and MAAP codes were used to determine the success criteria. Engineering judgment is used to determine the appropriate code for the particular success criteria or scenario being examined.

k. The results of the thermal-hydraulic analysis

Response to Action Item 19-35 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-35 (AI 19-35)

Section 19.1.4.1.1.3, it is unclear what is meant by the representative results. Are the results provided not the results from the analysis performed?

Response

Both RELAP and MAAP were used. Section 19.1.4.1.1.7 states that the RELAP5 code is used to analyze the thermal-hydraulic behavior of the plant, and the MAAP code is used to evaluate the success criteria. The thermal-hydraulic analysis is used to determine the success criteria. Hence, both RELAP and MAAP were used to determine the success criteria.

DCD Table 19.1-12 provides a summary of success criteria evaluated with RELAP, and Table 19.1-13 provides a summary of the success criteria evaluated with MAAP.

Section 19.1.4.1.1.3.k. is revised as shown in Attachment.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Section 19.1.4.1.1.3.k DCD Markup for Question PRA-35

[Section 19.1.4.1.1.3 k., page 19.1-44]

k. The results of the thermal-hydraulic analysis

~~Representative results of the thermal-hydraulic analysis are given in Table 19.1-12 and Table 19.1-13.~~ Table 19.1-12 provides a summary of success criteria evaluated with RELAP, and Table 19.1-13 provides a summary of the success criteria evaluated with MAAP.

l. Determination of success criteria

Response to Action Item 19-36 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-36 (AI 19-36)

Section 19.1.4.1.1.7, it is unclear how the dependencies between HFEs are assessed and how 'appropriate' is determined.

Response

When multiple HFEs appear in a cutset, the HFE dependency analysis in the APR1400 PRA is based on the direct estimation and positive dependence model methodologies presented in NUREG/CR-1278.

Section 19.1.4.1.1.6 of the DCD is revised to state that the dependency analysis is based on the direct estimation and positive dependence model methodologies presented in NUREG/CR-1278, and to briefly describe how the dependencies are incorporated into the model (See Attachment 1).

Section 19.1.4.1.1.7 of the DCD is revised to refer to Section 19.1.4.1.1.6 for details of HFE dependency determination and incorporation into the model (See Attachment 2).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment 1 – Section 19.1.4.1.1.6 DCD Markup for Question PRA-36

[This paragraph is added to the end of Section 19.1.4.1.1.6, page 19.1-57]

To estimate the failure probability for the execution steps, the CBDTM, HCR/ORE, and ARM methodologies use the THERP methodology.

When multiple HFEs are contained within an accident sequence, the dependency between the HFEs must be assessed. HFE dependency is based on the direct estimation and positive dependence model methodologies described in NUREG/CR-1278 (Reference 21), and incorporated into the model during cutset post-processing. To minimize the possibility of prematurely truncating cutsets containing multiple HFEs, the PRA model quantification is performed with the HFE probabilities set artificially high. After the dependencies are applied, the actual calculated HFE values are re-inserted into the cutsets.

19.1.4.1.1.7 Quantification

This subsection summarizes the process used to quantify the frequency of core damage.

APR1400 DCD TIER 2

Attachment 2 – Section 19.1.4.1.1.7 DCD Markup for Question PRA-36

[Paragraph 2 of Section 19.1.4.1.1.7, spanning pages 19.1-57 and 19.1-58]

The frequencies of the core damage sequences are calculated by obtaining sequence level minimal cutsets. Post-processing of these cutsets is performed to account for factors that are not readily incorporated into the fault trees themselves. For example, this post-processing allows the identification of cutsets that contain more than one post-initiator HFE. The dependencies between multiple HFEs are assessed as ~~appropriate~~described in Section 19.1.4.1.1.6, and included in the cutsets ~~in~~ during post-processing. The event trees and fault trees were developed using the SAREX computer code and solved using the FTREX computer code. The SAREX model for the APR1400 constitutes a large, detailed set of event trees and fault trees. The model whose results are described in this report consists of the following:

Response to Action Item 19-38 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-38 (AI 19-38)

Section 19.1.1 “Uses and Applications of the PRA,” the uses of PRA in the design process are not specifically described.

Response

The uses of PRA in the design process is described in Subsection 19.1.3.4 of the DCD (see Page 19.1-32).

Impact on DCD

There is no impact on the DCD.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Response to Action Item 19-40 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-40 (AI 19-40)

Section 19.1.4.1.1.1, “Initiating Events” and Section 19.1.4.1.1.3, “Success Criteria Analysis,” the staff could not find the details of evaluations/analysis performed to support the information provided in the initiating events and success criteria sections.

Response

Regarding Section 19.1.4.1.1.1, “Initiating Events,” see the responses to PRA-29 (AI 19-29), PRA-61 (AI 19-61), PRA-62 (AI 19-62), PRA-64 (AI 19-64), PRA-65 (AI 19-65), PRA-66 (AI 19-66), and PRA-68 (AI 19-68).

Regarding Section 19.1.4.1.1.3, “Success Criteria Analysis,” see the responses to PRA-32 (AI 19-32), PRA-33 (AI 19-33), PRA-35 (AI 19-35), PRA-78 (AI 19-78), PRA-79 (AI 19-79), PRA-80 (AI 19-80), PRA-82 (AI 19-82), PRA-83 (AI 19-83) and PRA-85 (AI 19-85).

Finally, note that Sections 19.1.4.1.1.1 and 19.1.4.1.1.3 of the DCD describes the Initiating Events and Success Criteria analyses at a high level. The PRA is documented in an extensive set of the PRA notebooks, which are cross-referenced in the PRA Summary Report (APR1400-E-P-NR-14001-P). Thus details of these analyses are contained in the Initiating Event Analysis notebook, APR1400-K-P-NR-013101-P, and the Success Criteria Analysis notebook, APR1400-K-P-NR-013103-P, respectively.

Impact on DCD

There is no impact on the DCD.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Response to Action Item 19-41 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-41 (AI 19-41)

Section 19.1.4.1.1.2, “Accident Sequence Analysis,” the staff could find no discussions on event tree development and related assumptions.

Response

Section 19.1.4.1.1.2 of the DCD describes this at a high level. Details of this analysis for each initiating event are contained in the Accident Sequence Analysis notebook, APR1400-K-P-NR-013102-P. However, the DCD is updated to state that the accident sequence analysis is consistent with the methodologies presented in NUREG/CR-2300.

See Attachment of the response to Issue # PRA-71 (AI 19-71).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Response to Action Item 19-51 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-51 (AI 19-51)

DCD Page 19.1-149 states, "Several cables have been identified as requiring fire protection features to prevent damage or spurious operation of related components." It is unclear which SSCs are affected by these cables and how the affected SSCs are modeled in the PRA. The staff found the same statement made on DCD Page 19.1-221 for LPSD fire analysis.

Response

In Task 9 of the APR1400 fire PRA (FPRA), due to lack of detailed design information at the time of the analysis, detailed circuit analyses were not performed. Instead, it was conservatively assumed that fire damage to any cable supporting an FPRA credited component results in the worst case failure mode for that component. Tables 1 and 2, below, identify cables in each fire compartment that have been assumed to be either protected, had their circuits re-routed or redesigned to prevent failure, or can be shown through detailed circuit analysis to not result in the modeled failure mode.

In general, cables in a fire compartment were identified as candidates for removal if the impact from their postulated damage resulted in a high core damage frequency (CDF) for the fire compartment with respect to the other fire compartments in the FPRA. Within each analyzed fire compartment, the goal was to identify cables which were driving risk in the room.

Table 1 sorts the list by fire compartment; there are 59 impacted fire compartments. Table 2 sorts the list by supported component failure mode (e.g., basic event); there are 75 impacted component basic events. A fire compartment may contain one or more component basic events, and a component basic event may be removed from more than one fire compartment scenario flag files resulting in a list of 220 “fire compartment – component basic event” combinations.

In addition to the fire compartment and component basic events, Tables 1 and 2 include the cable types, assumed cable function, modeled failure mode (given damage to the cable), and the exclusion criteria. The cable types are identified by code, and are as follows:

- P = power cable
- C = control cable
- I = instrument cable

The assumed cable function is the conservative function chosen in Task 9 of the FPRA for the cable as described above. The modeled failure mode is the PRA impact given fire damage to the cable(s). The exclusion criteria provides the reason for removal of the cables from the scenario flag file.

An exclusion criteria is provided for each cable. In some cases, it simply needs to be determined that fire-induced cable damage will not fail the supported component in a manner

detrimental to the prevention of core damage (e.g., fiber optic cables are not susceptible to fire-induced hot shorts, so if the failure mode of concern is spurious operation, damage to the cable does not result in spurious operation of the component). This requires detailed circuit analysis for the cable in question. In other cases, the cable is identified as requiring some sort of "cable protection scheme" to prevent damage to the cable for a specific fire scenario.

For the purposes of this analysis, "cable protection scheme" can mean any scheme employed by Fire Protection Engineers to prevent fire damage to the component associated with the cables for a specific fire scenario including, but not limited to, fire wrap, re-routing the cable, circuit modification to prevent spurious operation, placing specific individual control cables (or circuits) in grounded conduit to prevent fire-induced hot shorts, etc.

The information contained in Tables 1 and 2 is already based on the preliminary updated FPRA model. Since the full power internal events FPRA implicitly assumes that these "cable protection schemes" will be implemented, they are applicable to the LPSD FPRA, as well. Tables 1 and 2 will be documented in the FPRA notebooks during the PRA update.

Impact on DCD
There is no impact on the DCD.

Impact on PRA
These changes are already included in the preliminary updated full power FPRA model; hence, there is no impact on this model. The current LPSD FPRA model documented in the DCD includes most of these changes, but the changes added during the preliminary updated full power FPRA are not included. This results in conservative LPSD FPRA results as there are additional protected cables which are not credited (i.e., are assumed to fail) in the LPSD FPRA model. The LPSD FPRA model may need to be updated to reflect these changes.

Impact on Technical Specifications
There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports
There is no impact on any Technical, Topical, or Environmental Reports.

Response to Action Item 19-51 Section 19.1

Table 1 – Removed Fire PRA Cables (by Fire Compartment)

FC	Component Basic Event	Cable Type	Function	Modeled Failure Mode	Exclusion Criteria
F000-ACVU	F-EF-PA21-FAIL	C, I	Relay and Metering Panel PA-21	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
	F-EF-PA22-FAIL	I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	NPXHY-M-UAT01M	C, I	Support UAT TR01M	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
F000-ADGC	F-FW-HV-133-OC	I	SUFW to SG2	Spurious closing of valve FW-0133	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
	FWMVO-N-104	I, I	SUFW to SG2	Surrogate for spurious opening of FW-0123	Ensure SUFW flow to normal FW line is not a flow diversion, or protect cable in FC
	MSAVO-A-109	I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
F000-ADGD	AFMVC1B-046	I, I, I, I	TD AF PP01A Isol Valve	Valve fails to control TD AF flow to SG 2	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	AFSVI1B-0038	I, I, I, I, I, I	TD AF PP01A Mod Valve	Valve fails to control TD AF flow to SG 2	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	F-EF-PA03B-INV	C, C	Failure of PA-03B	Various, but TD AF PP01A Mod Vlv AF-037	Verify cables do not fail AF-037, re-route cable out of this FC, or protect cable in this FC
	F-EF-PA03B-MCC	C, C	Failure of PA-03B	Various, but TD AF PP01A Mod Vlv AF-037	Verify cables do not fail AF-037, re-route cable out of this FC, or protect cable in this FC
F000-AFHU	NGBSY3N-LC19N	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)
F000-C01	RPIAT-A-PY102A	I, I	Support RC-PT-201A	Failure of input trip signal to LCL processor A (1/4)	Effectively separate cables or protect cables in this FC
	RPIAT-B-PY102B	I,	Support RC-PT-201B	Failure of input trip signal to LCL processor A (1/4)	Effectively separate cables or protect cables in this FC
	RPIAT-C-PY102C	I, I	Support RC-PT-201C	Failure of input trip signal to LCL processor A (1/4)	Effectively separate cables or protect cables in this FC
	RPIAT-D-PY102D	I	Support RC-PT-201D	Failure of input trip signal to LCL processor A (1/4)	Effectively separate cables or protect cables in this FC
F000-TB	NBBSY-S-SW03N	I, I, I, I	Non-1E 4.16KV SWGR 3-SW03N	Fail AAC to SW01A/B/C/D	Either verify cable failures do not fail 3-SW03N, or protect cables in FC
	NGBSY3N-LC19N	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)

Response to Action Item 19-51 Section 19.1

Table 1 – Removed Fire PRA Cables (by Fire Compartment)

FC	Component Basic Event	Cable Type	Function	Modeled Failure Mode	Exclusion Criteria
	PFHBC2A-SW01C-E2	C, C	4kV SWGR SW01C breaker E2	Prevent SW01C from being powered from AAC	Either verify cable failure does not prevent AAC supply to SW01C, or protect cable in FC
F050-A04A	SXAHR-B-AH01B	C, C	"B" SX Cooling Tower Fan 1B	Fail "B" SX Cooling Tower Fan 1B	Verify cables are not in this FC, cables do not fail SX AH01B, or protect cable in FC
	SXAHR-B-AH02B	C, C	"B" SX Cooling Tower Fan 2B	Fail "B" SX Cooling Tower Fan 2B	Verify cables are not in this FC, cables do not fail SX AH02B, or protect cable in FC
	SXFMY1B-FT01B-MOTOR	C	"B" SX Debris Filter 1B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT01B, or protect cable in FC
	SXFMY2B-FT02B-MOTOR	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC
	SXFMY3B-FT03B-MOTOR	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC
F067-T02	NBBSY-S-SW03N	I, I	Non-1E 4.16KV SWGR 3-SW03N	Fail AAC to SW01A/B/C/D	Either verify cable failures do not fail 3-SW03N, or protect cables in FC
	NGBSY3N-LC19N	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)
	PFHBC2A-SW01C-E2	C, P	SW01C AAC Supply Breaker	Fail AAC to SW01C	Either verify cable failures do not fail breaker SW01C-E2, or protect cable in FC
F073-T11	NBBSY-S-SW03N	I, I	Non-1E 4.16KV SWGR 3-SW03N	Fail AAC to SW01A/B/C/D	Either verify cable failures do not fail 3-SW03N, or protect cables in FC
	NPXHY-M-SAT02M	C, P	Support SAT TR02M	Fail SAT TR02M	Either verify cable failures do not fail SAT 02M, or protect cable in FC
	NPXHY-N-SAT02N	C, P	Support SAT TR02N	Fail SAT TR02N	Either verify cable failures do not fail SAT 02N, or protect cable in FC
F078-A02C	SXAHR-B-AH01B	C, C	"B" SX Cooling Tower Fan 1B	Fail "B" SX Cooling Tower Fan 1B	Verify cables are not in this FC, cables do not fail SX AH01B, or protect cable in FC
	SXAHR-B-AH02B	C, C	"B" SX Cooling Tower Fan 2B	Fail "B" SX Cooling Tower Fan 2B	Verify cables are not in this FC, cables do not fail SX AH02B, or protect cable in FC
	SXFMY2B-FT02B-MOTOR	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC
	SXFMY3B-FT03B-MOTOR	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC

Response to Action Item 19-51 Section 19.1

Table 1 – Removed Fire PRA Cables (by Fire Compartment)

FC	Component Basic Event	Cable Type	Function	Modeled Failure Mode	Exclusion Criteria
F078-A02D	PFBSY1B-SW01B	C	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cable is only for sync circuit breaker, and does not fail SW01B (NOTE: no impact if included)
F078-A03C	PFBSY2A-SW01C	C	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cable is only for sync circuit breaker, and does not fail SW01C (NOTE: no impact if included)
F078-A03D	PFBSY2B-SW01D	C, C, P, P	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables are only for sync circuit breaker, and do not fail SW01D (NOTE: no impact if included)
F078-A04C	PELXY-A-LX09A-P	C	Support primary loop controller LX09A	Fail AOV MS-109 (TDP PP01B Stm Sup)	Verify this "A" cable does not fail AF TPP PP01B steam valve MS-109, or protect cable in this FC
	PFBSY1A-SW01A	C, P	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables are only for sync circuit breaker, and do not fail SW01A (NOTE: no impact if included)
F078-A04D	PELXY-B-LX11B-P	C	Support primary loop controller LX11B	Fail AOV MS-110 (TDP PP01A Stm Sup)	Verify this "B" cable does not fail AF TPP PP01A steam valve MS-110 or protect cable in this FC
	PFBSY1B-SW01B	C, P	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cables are only for sync circuit breaker, and do not fail SW01B (NOTE: no impact if included)
F078-A05C	AFMVT2B-044	P, P, P	Support "B" train AF Valve AF-044	Spurious close, or prevent operation of AF-044	Verify these cables do not fail this "B" AF MOV, or protect these cables in this Div. "A" FC
F078-A05D	AFMVC1A-045	P, P, P	Support "A" train AF Valve AF-045	Spurious close, or prevent operation of AF-045	Verify these cables do not fail this "A" AF MOV, or protect these cables in this Div. "B" FC
	PFBSY2B-SW01D	C, C, P, P	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables are only for sync circuit breaker, and do not fail SW01D (NOTE: no impact if included)
F078-A11D	PFBSY2B-SW01D	C, C	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cable does not fail SW01D, or protect cable in this compartment
F078-A19A	PFBSY1A-SW01A	C, I	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables do not fail SW01A, or protect cables in this compartment
	PFBSY2A-SW01C	C, I	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cables do not fail SW01C, or protect cables in this compartment
F078-A19B	PFBSY1B-SW01B	I	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cable does not fail SW01B, or protect cable in this compartment
	PFBSY2B-SW01D	I, I	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables do not fail SW01D, or protect cables in this compartment
F078-A25A	SXAHR-B-AH01B	C, C	"B" SX Cooling Tower Fan 1B	Fail "B" SX Cooling Tower Fan 1B	Verify cables are not in this FC, cables do not fail SX AH01B, or protect cable in FC

Response to Action Item 19-51 Section 19.1

Table 1 – Removed Fire PRA Cables (by Fire Compartment)

FC	Component Basic Event	Cable Type	Function	Modeled Failure Mode	Exclusion Criteria
	SXAHR-B-AH02B	C, C	"B" SX Cooling Tower Fan 2B	Fail "B" SX Cooling Tower Fan 2B	Verify cables are not in this FC, cables do not fail SX AH02B, or protect cable in FC
	SXFMY1B-FT01B-MOTOR	C	"B" SX Debris Filter 1B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT01B, or protect cable in FC
	SXFMY2B-FT02B-MOTOR	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC
	SXFMY3B-FT03B-MOTOR	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC
F078-A47B	NGBSY3N-LC19N	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)
F078-AEEB	PFBSY2B-SW01D	C, I, C, I	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables do not fail SW01D, or protect cables in this compartment
F078-AGAC	ATAVO-C-009	I	Support AOV AT-009	Fail AOV AT-009 (AF TDP PP01A Stm Sup)	Verify cable does not fail AT-009, or protect cable in this compartment
	NPXHY-M-SAT02M	P	Support SAT TR02M	Fail SAT TR02M	Either verify cable failures do not fail SAT 02M, or protect cable in FC
	PELXY-C-LX04C-P	C	Support primary loop controller LX04C	Fail MOV AF-045	Verify cable does not fail AF-045, or protect cable in this compartment
	PFBSY1A-SW01A	C	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables do not fail SW01A, re-route, or protect cables in this compartment
	PFBSY2A-SW01C	C, C, I, I, I	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cables do not fail SW01C, re-route, or protect cables in this compartment
	PGBSY2A-LC01C	C, C	Support 480V LC01C	Fail LC01C	Verify cables do not fail LC01C, re-route, or protect cables in this compartment
	SXAHR-B-AH01B	C, C	"B" SX Cooling Tower Fan 1B	Fail "B" SX Cooling Tower Fan 1B	Verify cables are not in this FC, cables do not fail SX AH01B, or protect cable in FC
	SXAHR-B-AH02B	C, C	"B" SX Cooling Tower Fan 2B	Fail "B" SX Cooling Tower Fan 2B	Verify cables are not in this FC, cables do not fail SX AH02B, or protect cable in FC
	SXFMY1B-FT01B-MOTOR	C	"B" SX Debris Filter 1B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT01B, or protect cable in FC
	SXFMY2B-FT02B-MOTOR	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC
	SXFMY3B-FT03B-MOTOR	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC

Response to Action Item 19-51 Section 19.1

Table 1 – Removed Fire PRA Cables (by Fire Compartment)

FC	Component Basic Event	Cable Type	Function	Modeled Failure Mode	Exclusion Criteria
F078-AGAD	ATAVO-D-010	I	Support AOV AT-010	Fail AOV AT-010 (AF TDP PP01B Stm Sup)	Verify cable does not fail AT-010, or protect cable in this compartment
	NPXHY-N-SAT02N	P	Support SAT TR02N	Fail SAT TR02N	Either verify cable failures do not fail SAT 02N, or protect cable in FC
	PFBSY1B-SW01B	I	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cables do not fail SW01B, re-route, or protect cables in this compartment
	PFBSY2B-SW01D	C, I, C, I	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables do not fail SW01D, re-route, or protect cables in this compartment
	PFHBC2B-SW01D-J2	C	SW01D SAT Supply Breaker	Prevent SW01D SAT breaker from operating	Verify cables do not fail SW01D-J2, or protect cables in this compartment
	PFHBO2B-SW01D-G2	C	SW01D UAT Supply Breaker	Prevent SW01D UAT breaker from operating	Verify cables do not fail SW01D-G2, or protect cables in this compartment
	SXAHR-B-AH01B	P, P	"B" SX Cooling Tower Fan 1B	Fail "B" SX Cooling Tower Fan 1B	Verify cables do not fail SX AH01B, or protect cable in FC
	SXAHR-B-AH02B	P, P	"B" SX Cooling Tower Fan 2B	Fail "B" SX Cooling Tower Fan 2B	Verify cables do not fail SX AH02B, or protect cable in FC
F100-A05D	F-EF-PA22-FAIL	C	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	NGBSY3N-LC19N	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)
	PFBSY1A-SW01A	C	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables are only for fault recorder, and do not fail SW01A, or protect cable in this FC
	PFBSY1B-SW01B	C	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cables are only for fault recorder, and do not fail SW01B, or protect cable in this FC
	PFBSY2A-SW01C	C	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cables are only for fault recorder, and do not fail SW01C, or protect cable in this FC
	PFBSY2B-SW01D	C	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables are only for fault recorder, and do not fail SW01D, or protect cable in this FC
	PFHBC1B-SW01B-B2	C	SW01B AAC Supply Breaker	Fail SW01B-B2	Verify cables are only for fault recorder, and do not fail SW01B-B2, or protect cable in this FC
	PFHBC2B-SW01D-E2	C	SW01D AAC Supply Breaker	Fail SW01D-E2	Verify cables are only for fault recorder, and do not fail SW01D-E2, or protect cable in this FC
	PFHBO1A-SW01A-H2	C	SW01A UAT Supply Breaker	Fail SW01A-H2	Verify cables are only for fault recorder, and do not fail SW01A-H2, or protect cable in this FC

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Table 1 – Removed Fire PRA Cables (by Fire Compartment)

FC	Component Basic Event	Cable Type	Function	Modeled Failure Mode	Exclusion Criteria
	PFHBO1B-SW01B-H2	C	SW01B UAT Supply Breaker	Fail SW01B-H2	Verify cables are only for fault recorder, and do not fail SW01B-H2, or protect cable in this FC
	PFHBO2A-SW01C-C2	C	SW01C UAT Supply Breaker	Fail SW01C-C2	Verify cables are only for fault recorder, and do not fail SW01C-C2, or protect cable in this FC
	PFHBO2B-SW01D-G2	C	SW01D UAT Supply Breaker	Fail SW01D-G2	Verify cables are only for fault recorder, and do not fail SW01D-G2, or protect cable in this FC
F100-A06D	F-EF-PA22-FAIL	C	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	NGBSY3N-LC19N	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)
	PFBSY1A-SW01A	C	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables are only for fault recorder, and do not fail SW01A, or protect cable in this FC
	PFBSY1B-SW01B	C, I	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cables are only for fault recorder, and do not fail SW01B, or protect cable in this FC
	PFBSY2A-SW01C	C	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cables are only for fault recorder, and do not fail SW01C, or protect cable in this FC
	PFBSY2B-SW01D	C, C	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables are only for fault recorder, and do not fail SW01D, or protect cable in this FC
	PFHBC1B-SW01B-B2	C	SW01B AAC Supply Breaker	Fail SW01B-B2	Verify cables are only for fault recorder, and do not fail SW01B-B2, or protect cable in this FC
	PFHBC1B-SW01B-D2	C	SW01B EDG Supply Breaker	Fail SW01B-D2	Verify cables are only for fault recorder, and do not fail SW01B-D2, or protect cable in this FC
	PFHBC2B-SW01D-E2	C, C	SW01D AAC Supply Breaker	Fail SW01D-E2	Verify cables are only for fault recorder, and do not fail SW01D-E2, or protect cable in this FC
	PFHBO1A-SW01A-H2	C	SW01A UAT Supply Breaker	Fail SW01A-H2	Verify cables are only for fault recorder, and do not fail SW01A-H2, or protect cable in this FC
	PFHBO1B-SW01B-H2	C	SW01B UAT Supply Breaker	Fail SW01B-H2	Verify cables are only for fault recorder, and do not fail SW01B-H2, or protect cable in this FC
	PFHBO2A-SW01C-C2	C	SW01C UAT Supply Breaker	Fail SW01C-C2	Verify cables are only for fault recorder, and do not fail SW01C-C2, or protect cable in this FC
	PFHBO2B-SW01D-G2	C	SW01D UAT Supply Breaker	Fail SW01D-G2	Verify cables are only for fault recorder, and do not fail SW01D-G2, or protect cable in this FC
F100-A08C	PFBSY1A-SW01A	C	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables are only for fault recorder, and do not fail SW01A, or protect cable in this FC

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Table 1 – Removed Fire PRA Cables (by Fire Compartment)

FC	Component Basic Event	Cable Type	Function	Modeled Failure Mode	Exclusion Criteria
	PFBSY2A-SW01C	C	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cables are only for fault recorder, and do not fail SW01C, or protect cable in this FC
	PFHBC1A-SW01A-G2	C	SW01A AAC Supply Breaker	Fail SW01A-G2	Verify cables are only for fault recorder, and do not fail SW01A-G2, or protect cable in this FC
	PFHBC2A-SW01C-E2	C	SW01C AAC Supply Breaker	Fail SW01C-E2	Verify cables are only for fault recorder, and do not fail SW01C-E2, or protect cable in this FC
	PFHBO1A-SW01A-H2	C	SW01A UAT Supply Breaker	Fail SW01A-H2	Verify cables are only for fault recorder, and do not fail SW01A-H2, or protect cable in this FC
	PFHBO2A-SW01C-C2	C	SW01C UAT Supply Breaker	Fail SW01C-C2	Verify cables are only for fault recorder, and do not fail SW01C-C2, or protect cable in this FC
F100-A08D	ATAVO-D-010	I	Support AOV AT-010	Fail AOV AT-010 (AF TDP PP01B Stm Sup)	Verify cable does not fail AT-010, or protect cable in this compartment
	F-EF-PA21-FAIL	C	Relay and Metering Panel PA-21	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
	F-EF-PA22-FAIL	C	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	PFBSY1B-SW01B	C	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cables are only for fault recorder, and do not fail SW01B, or protect cable in this FC
	PFBSY2B-SW01D	C, C	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables are only for fault recorder, and do not fail SW01D, or protect cable in this FC
F100-A10B	NGBSY3N-LC19N	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)
F100-A37B	NGBSY3N-LC19N	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)
F120-A01C	F-EF-PA22-FAIL	C	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
F120-A01D	PFBSY1B-SW01B	C	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cables are only for sync circuit breaker, and do not fail SW01B (NOTE: no impact if included)
	PFBSY2B-SW01D	C	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables are only for sync circuit breaker, and do not fail SW01D (NOTE: no impact if included)
F120-A05C	F-EF-PA22-FAIL	C, I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC

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Table 1 – Removed Fire PRA Cables (by Fire Compartment)

FC	Component Basic Event	Cable Type	Function	Modeled Failure Mode	Exclusion Criteria
F120-A05D	F-EF-PA22-FAIL	C, I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	NPXHY-M-SAT02M	C	Support SAT TR02M	Fail SAT TR02M	Verify existing cable protection (conduit) prevents spurious failure of SAT-02M, or protect cable in this FC
	NPXHY-M-UAT01M	C, I	Support UAT TR01M	Spurious operation failing UATs TR01M & N	Verify existing cable protection (conduit) prevents spurious failure of UAT-01M, or protect cable in this FC
	NPXHY-N-SAT02N	C	Support SAT TR02N	Fail SAT TR02N	Verify existing cable protection (conduit) prevents spurious failure of SAT-02N, or protect cable in this FC
	NPXHY-N-UAT01N	C, I	Support UAT TR01N	Spurious operation failing UATs TR01M & N	Verify existing cable protection (conduit) prevents spurious failure of UAT-01N, or protect cable in this FC
	PFBSY1A-SW01A	C	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables are only for fault recorder, and do not fail SW01A, or protect cable in this FC
	PFBSY1B-SW01B	C	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cables are only for fault recorder, and do not fail SW01B, or protect cable in this FC
	PFBSY2A-SW01C	C	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cables are only for fault recorder, and do not fail SW01C, or protect cable in this FC
	PFBSY2B-SW01D	C, C	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables are only for fault recorder, and do not fail SW01D, or protect cable in this FC
	PFHBO1A-SW01A-H2	C	SW01A UAT Supply Breaker	Fail SW01A-H2	Verify cables are only for fault recorder, and do not fail SW01A-H2, or protect cable in this FC
	PFHBO1B-SW01B-H2	C	SW01B UAT Supply Breaker	Fail SW01B-H2	Verify cables are only for fault recorder, and do not fail SW01B-H2, or protect cable in this FC
	PFHBO2A-SW01C-C2	C	SW01C UAT Supply Breaker	Fail SW01C-C2	Verify cables are only for fault recorder, and do not fail SW01C-C2, or protect cable in this FC
	PFHBO2B-SW01D-G2	C	SW01D UAT Supply Breaker	Fail SW01D-G2	Verify cables are only for fault recorder, and do not fail SW01D-G2, or protect cable in this FC
F120-A08C	F-EF-PA22-FAIL	I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
F120-A09C	ATAVO-C-009	I	Support AOV AT-009	Fail AOV AT-009 (AF TDP PP01A Stm Sup)	Verify cable does not fail AT-009, or protect cable in this compartment

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Table 1 – Removed Fire PRA Cables (by Fire Compartment)

FC	Component Basic Event	Cable Type	Function	Modeled Failure Mode	Exclusion Criteria
	F-EF-PA22-FAIL	I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
F120-A09D	AFMVC1A-045	C, C, C	Support "A" train AF Valve AF-045	Spurious close, or prevent operation of AF-045	Verify these cables do not fail this "A" AF MOV, or protect these cables in this Div. "B" FC
	ATAVO-D-010	I	Support AOV AT-010	Fail AOV AT-010 (AF TDP PP01B Stm Sup)	Verify cable does not fail AT-010, or protect cable in this compartment
F120-A11B	MSAVO-B-110	C	Steam supply to TD AF PP01A	AOV MS-110 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
F120-A14A	MSAVO-A-109	C, I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	PELXY-A-LX09A-P	C, C	Support primary loop controller LX09A	Fail AOV MS-109 (TDP PP01B Stm Sup)	Verify this "A" cable does not fail AF TPP PP01B steam valve MS-109, or protect cable in this FC
F120-A15B	MSAVO-B-110	C	Steam supply to TD AF PP01A	AOV MS-110 fails to open on demand	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	PELXY-B-LX11B-P	C, C	Support primary loop controller LX11B	Fail AOV MS-110 (TDP PP01A Stm Sup)	Verify these "B" cables do not fail AF TPP PP01A steam valve MS-110 or protect cables in this FC
F120-AGAA	F-EF-PA21-FAIL	C, I	Relay and Metering Panel PA-21	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
	F-EF-PA22-FAIL	I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	MSAVO-A-109	C, C, I, I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	NPXHY-M-UAT01M	C, I	UAT TR01M	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
	PELXY-A-LX09A-P	C, C, C, C	Support primary loop controller LX09A	Fail AOV MS-109 (TDP PP01B Stm Sup)	Verify this "A" cable does not fail AF TPP PP01B steam valve MS-109, or protect cable in this FC
F120-AGAC	AFSVI1A-0037	I, I	TD AF PP01A Mod Valve AF-037	Fails flow from TD AF PP01A to SG 1	Either verify cables do not fail AF-037, or protect in this FC
	F-CC-MV-021-OC	I	CC HX HE01A Disch MOV	Spurious close fails CC HX HE01A	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
	F-CC-MV-023-OC	I	CC HX HE02A Disch MOV	Spurious close fails CC HX HE02A	Verify cable is fiber optic (i.e., no SO), or protect cable in FC

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Table 1 – Removed Fire PRA Cables (by Fire Compartment)

FC	Component Basic Event	Cable Type	Function	Modeled Failure Mode	Exclusion Criteria
	F-CC-MV-027-CO	I	"A" CC HX Bypass MOV	Spurious open bypasses all "A" CC HXs	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
	F-EF-PA21-FAIL	C, C, C, I, I, I	Relay and Metering Panel PA-21	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
	F-EF-PA22-FAIL	I, I, I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	F-FW-HV-131-OC	I	SG 1 Downcomer Line FWIV	Fail SUFW to SG 1	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
	F-FW-HV-133-OC	I	SG 2 Downcomer Line FWIV	Fail SUFW to SG 2	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
	MSAVO-A-109	I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
	MSAVO-B-110	I	Steam supply to TD AF PP01A	AOV MS-110 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
	MSMVT-B-105	I	SG 1 MS ADV Block Valve MS-105	Spurious close blocks ADV MS-101 flow path	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
	MSMVT-D-108	I	SG 2 MS ADV Block Valve MS-108	Spurious close blocks ADV MS-104 flow path	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
	NPXHY-M-UAT01M	C, C, C, I, I, I	UAT TR01M	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
	PELXY-A-LX09A-P	C	Support primary loop controller LX09A	Fail AOV MS-109 (TDP PP01B Stm Sup)	Verify this "A" cable does not fail AF TPP PP01B steam valve MS-109, or protect cable in this FC
	PFBSY1A-SW01A	C, I	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables do not fail SW01A, or protect cables in this compartment
	PFBSY2A-SW01C	C, I	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cables do not fail SW01C, or protect cables in this compartment
	PGBSY2A-LC01C	I, I	Support 480V LC01C	Fail LC01C	Verify cables do not fail LC01C, or protect cables in this compartment
F120-AGAD	AFMVC1B-046	I, I, I	TD AF PP01A Isol Valve	Valve fails to control TD AF flow to SG 2	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	AFSVI1B-0038	I, I	TD AF PP01A Mod Valve	Valve fails to control TD AF flow to SG 2	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	DCBSY-M-MC01M	I	Support non-1E 125VDC Bus MC01M	Fail non-1E 125VDC Bus MC01M	Verify cable is fiber optic (i.e., no SO), or protect cable in FC

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Table 1 – Removed Fire PRA Cables (by Fire Compartment)

FC	Component Basic Event	Cable Type	Function	Modeled Failure Mode	Exclusion Criteria
	F-EF-PA21-FAIL	C, C, C	Relay and Metering Panel PA-21	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
	F-EF-PA22-FAIL	I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	MSAVO-B-110	C	Steam supply to TD AF PP01A	AOV MS-110 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
	NPXHY-M-UAT01M	I	Support UAT TR01M	Spurious operation failing UATs TR01M & N	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
	NPXHY-N-SAT02N	C, C, C	Support SAT TR02N	Fail SAT TR02N	Verify cables in individual conduit precluding SO failures of SAT 02N, or protect cables in FC
	NPXHY-N-UAT01N	C, C, C, I, I, I	Support UAT TR01N	Spurious operation failing UATs TR01M & N	Verify "C" cables in conduit & "I" cables are FO both precluding SO failures, or protect cables in FC
	PELXY-B-LX06B-P	C	Support primary loop controller LX06B	Fail control of breaker SW01D-J2	Verify cables do not fail SW01D-J2, or protect cables in this compartment
	PELXY-B-LX11B-P	C	Support primary loop controller LX11B	Fail AOV MS-110 (TDP PP01A Stm Sup)	Verify this "B" cable does not fail AF TPP PP01A steam valve MS-110 or protect cable in this FC
	PFBSY1B-SW01B	C, I	Support 1E 4KV SWGR SW01B	Fail SW01B	Either verify cable failures do not fail SW01B, or protect cables in FC
	PFBSY2B-SW01D	C, C, I, I	Support 1E 4KV SWGR SW01D	Fail SW01D	Either verify cable failures do not fail SW01D, or protect cables in FC
	PFHBC1B-SW01B-A2	I, I	SW01B SAT Supply Breaker	Prevent SW01B SAT breaker from operating	Verify cables do not fail SW01B-J2, or protect cables in this compartment
	PFHBC2B-SW01D-J2	I, I	SW01D SAT Supply Breaker	Prevent SW01D SAT breaker from operating	Verify cables do not fail SW01D-J2, or protect cables in this compartment
	PFHBO1B-SW01B-H2	I	SW01B UAT Supply Breaker	Prevent SW01B UAT breaker from operating	Verify cables do not fail SW01B-H2, or protect cables in this compartment
	PFHBO2B-SW01D-G2	I	SW01D UAT Supply Breaker	Prevent SW01D UAT breaker from operating	Verify cables do not fail SW01D-G2, or protect cables in this compartment
	PGBSY1B-LC01B	C, C, I, I	Support 1E 480V LC LC01B	Fail LC01B	Either verify cable failures do not fail LC01B, or protect cables in FC
	PGBSY2B-LC01D	I, I	Support 1E 480V LC LC01D	Fail LC01D	Either verify cable failures do not fail LC01D, or protect cables in FC
F120-AMPB	MSAVO-A-109	C	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC

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Table 1 – Removed Fire PRA Cables (by Fire Compartment)

FC	Component Basic Event	Cable Type	Function	Modeled Failure Mode	Exclusion Criteria
	MSAVO-B-110	C	Steam supply to TD AF PP01A	AOV MS-110 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
	PELXY-B-LX11B-P	C	Support primary loop controller LX11B	Fail AOV MS-110 (TDP PP01A Stm Sup)	Verify this "B" cable does not fail AF TPP PP01A steam valve MS-110 or protect cable in this FC
F137-A01C	MSAVO-A-109	I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
F137-A05D	NBBSY-S-SW03N	I, I	Non-1E 4.16KV SWGR 3-SW03N	Fail AAC to SW01A/B/C/D	Either verify cable failures do not fail 3-SW03N, or protect cables in FC
F137-A11C	AFMVT2B-044	C, C, C, I, I, I	Support "B" train AF Valve AF-044	Spurious close, or prevent operation of AF-044	Verify these cables do not fail this "B" AF MOV, or protect these cables in this Div. "A" FC
F137-A11D	AFMVC1A-045	C, C, C, I, I, I	Support "A" train AF Valve AF-045	Spurious close, or prevent operation of AF-045	Verify these cables do not fail this "A" AF MOV, or protect these cables in this Div. "B" FC
	F-EF-PA21-FAIL	C	Relay and Metering Panel PA-21	Spurious operation failing UATs TR01M & N	Either verify cable failure does not fail UATs, or protect cable in FC
	NPXHY-N-SAT02N	C	Support SAT TR02N	Fail SAT TR02N	Verify cable in individual conduit precluding SO failure of SAT 02N, or protect cable in FC
	NPXHY-N-UAT01N	C	Support UAT TR01N	Spurious operation failing UATs TR01M & N	Verify cable in individual conduit precluding SO failure of UAT 01N, or protect cable in FC
F157-A01D	MSAVO-B-110	I	Steam supply to TD AF PP01A	AOV MS-110 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
F157-A16C	AFMVT2B-044	I, I, I	Support "B" train AF Valve AF-044	Spurious close, or prevent operation of AF-044	Verify these cables do not fail this "B" AF MOV, or protect these cables in this Div. "A" FC
F157-A17C	AFMVT2B-044	I, I, I	Support "B" train AF Valve AF-044	Spurious close, or prevent operation of AF-044	Verify these cables do not fail this "B" AF MOV, or protect these cables in this Div. "A" FC
	ATAVO-D-010	I	Support AOV AT-010	Fail AOV AT-010 (AF TDP PP01B Stm Sup)	Verify cable does not fail AT-010, or protect cable in this Div. "A" FC
	DCBCY-D-BC01D	I	Support 1E 125VDC Batt. Chgr. BC01D	Fail 1E 125VDC Batt. Chgr. BC01D	Verify cable does not fail BC01D, or protect in this Div. "A" FC
F157-A19C	AFMVT2B-044	I, I, I	Support "B" train AF Valve AF-044	Spurious close, or prevent operation of AF-044	Verify these cables do not fail this "B" AF MOV, or protect these cables in this Div. "A" FC
F157-A19D	AFMVC1A-045	I, I, I	Support "A" train AF Valve AF-045	Spurious close, or prevent operation of AF-045	Verify these cables do not fail this "A" AF MOV, or protect these cables in this Div. "B" FC

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Table 1 – Removed Fire PRA Cables (by Fire Compartment)

FC	Component Basic Event	Cable Type	Function	Modeled Failure Mode	Exclusion Criteria
F157-A25C	AFMVT2B-044	I, I, I	Support "B" train AF Valve AF-044	Spurious close, or prevent operation of AF-044	Verify these cables do not fail this "B" AF MOV, or protect these cables in this Div. "A" FC
	ATAVO-C-009	I	Support AOV AT-009	Fail AOV AT-009 (AF TDP PP01A Stm Sup)	Verify cable does not fail AT-009, or protect cable in this compartment
	MSAVO-A-109	I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	MSMVT-D-108	I	SG 2 MS ADV Block Valve MS-108	Spurious close blocks ADV MS-104 flow path	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
	RCMVO-A-130	I	Support RC-200 Pilot Valve RC-130	Fail POSRV RC-200	Verify cable does not fail RC-130, or protect cable in this compartment
	RCMVO-A-132	I	Support RC-201 Pilot Valve RC-132	Fail POSRV RC-201	Verify cable does not fail RC-132, or protect cable in this compartment
	RCMVO-C-131	I	Support RC-200 Pilot Valve RC-131	Fail POSRV RC-200	Verify cable does not fail RC-131, or protect cable in this compartment
	RCMVO-C-133	I	Support RC-201 Pilot Valve RC-133	Fail POSRV RC-201	Verify cable does not fail RC-133, or protect cable in this compartment
	RCPVO-A-200	I	Support POSRV RC-200	Fail POSRV RC-200	Verify cable does not fail RC-200, or protect cable in this compartment
F157-ACPX	MSAVO-B-110	I, I	Steam supply to TD AF PP01A	AOV MS-110 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
	NBBSY-S-SW03N	I, I	Non-1E 4.16KV SWGR 3-SW03N	Fail AAC to SW01A/B/C/D	Either verify cable failures do not fail 3-SW03N, or protect cables in FC
F157-AMAX	MSAVO-A-109	I, I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
F157-ATOC	MSAVO-A-109	I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
FK-K01	CCMVT3B-026	C	Support CC HX HE03B Disch Vlv CC-026	Fail to open CC-026 fails CC HX HE03B	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
	F-CC-MV-022-OC	C	Support CC HX HE01B Disch Vlv CC-022	Spurious close CC-022 fails CC HX HE01B	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
	F-CC-MV-024-OC	C	Support CC HX HE02B Disch Vlv CC-024	Spurious close CC-024 fails CC HX HE02B	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
	F-CC-MV-028-CO	C, P	Support B CC HX Bypass Vlv CC-028	Spurious open CC-028 fails all B CC HXs	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02

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Table 1 – Removed Fire PRA Cables (by Fire Compartment)

FC	Component Basic Event	Cable Type	Function	Modeled Failure Mode	Exclusion Criteria
	PHBSY1B-MC02B	P	Support 480VAC MCC MC02B	Fail B SX Pump Rm Cooling Fan AH01B	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
	SXMVR-B-MV073	C	Support SXCT Fan Sup Valve SX-073	Spurious close fails flow to Div. B SXCT Fans	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
	SXMVR-B-MV074	C	Support SXCT Fan Byp Valve SX-073	Spurious open diverts flow from Div. B SXCT Fans	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
	SXMVT2B-048	C, P	Support SX Pp 2B disch MOV SX-048	Spurious close of SX-048 fails SX Pp 2B	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
	VGAHR1B-AH01B	C, C, C, P, P, P	Support ESW Pump Rm Sup Fan AH01B	Fail ESW Pump Rm Sup Fan AH01B	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
	VGAHR2B-AH02B	C, C, P, P	Support ESW Pump Rm Sup Fan AH02B	Fail ESW Pump Rm Sup Fan AH02B	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02

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Table 2 – Removed Fire PRA Cables (by Component Basic Event)

Component Basic Event	FC	Cable Type	Function	Potential Failure Mode	Exclusion Criteria
AFMVC1A-045	F078-A05D	P, P, P	Support "A" train AF Valve AF-045	Prevent operation of AF-045	Verify these cables do not fail this "A" AF MOV, or protect these cables in this Div. "B" FC
	F120-A09D	C, C, C	Support "A" train AF Valve AF-045	Spurious close, or prevent operation of AF-045	Verify these cables do not fail this "A" AF MOV, or protect these cables in this Div. "B" FC
	F137-A11D	C, C, C, I, I, I	Support "A" train AF Valve AF-045	Spurious close, or prevent operation of AF-045	Verify these cables do not fail this "A" AF MOV, or protect these cables in this Div. "B" FC
	F157-A19D	I, I, I	Support "A" train AF Valve AF-045	Spurious close, or prevent operation of AF-045	Verify these cables do not fail this "A" AF MOV, or protect these cables in this Div. "B" FC
AFMVC1B-046	F000-ADGD	I, I, I, I	TD AF PP01B Isol Valve	Valve fails to control TD AF flow to SG 2	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	F120-AGAD	I, I, I	TD AF PP01B Isol Valve	Valve fails to control TD AF flow to SG 2	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
AFMVT2B-044	F078-A05C	P, P, P	Support "B" train AF Valve AF-044	Prevent operation of AF-044	Verify these cables do not fail this "B" AF MOV, or protect these cables in this Div. "A" FC
	F137-A11C	C, C, C, I, I, I	Support "B" train AF Valve AF-044	Spurious close, or prevent operation of AF-044	Verify these cables do not fail this "B" AF MOV, or protect these cables in this Div. "A" FC
	F157-A16C	I, I, I	Support "B" train AF Valve AF-044	Spurious close, or prevent operation of AF-044	Verify these cables do not fail this "B" AF MOV, or protect these cables in this Div. "A" FC
	F157-A17C	I, I, I	Support "B" train AF Valve AF-044	Spurious close, or prevent operation of AF-044	Verify these cables do not fail this "B" AF MOV, or protect these cables in this Div. "A" FC
	F157-A19C	I, I, I	Support "B" train AF Valve AF-044	Spurious close, or prevent operation of AF-044	Verify these cables do not fail this "B" AF MOV, or protect these cables in this Div. "A" FC
	F157-A25C	I, I, I	Support "B" train AF Valve AF-044	Spurious close, or prevent operation of AF-044	Verify these cables do not fail this "B" AF MOV, or protect these cables in this Div. "A" FC
AFSVI1A-0037	F120-AGAC	I, I	TD AF PP01A Mod Valve AF-037	Fails flow from TD AF PP01A to SG 1	Either verify cables do not fail AF-037, or protect in this FC
AFSVI1B-0038	F000-ADGD	I, I, I, I, I, I	TD AF PP01B Mod Valve AF-038	Valve fails to control TD AF flow to SG 2	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	F120-AGAD	I, I	TD AF PP01B Mod Valve AF-038	Valve fails to control TD AF flow to SG 2	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
ATAVO-C-009	F078-AGAC	I	Support AOV AT-009	Fail AOV AT-009 (AF TDP PP01A Stm Sup)	Verify cable does not fail AT-009, or protect cable in this compartment
	F120-A09C	I	Support AOV AT-009	Fail AOV AT-009 (AF TDP PP01A Stm Sup)	Verify cable does not fail AT-009, or protect cable in this compartment

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Table 2 – Removed Fire PRA Cables (by Component Basic Event)

Component Basic Event	FC	Cable Type	Function	Potential Failure Mode	Exclusion Criteria
	F157-A25C	I	Support AOV AT-009	Fail AOV AT-009 (AF TDP PP01A Stm Sup)	Verify cable does not fail AT-009, or protect cable in this compartment
ATAVO-D-010	F078-AGAD	I	Support AOV AT-010	Fail AOV AT-010 (AF TDP PP01B Stm Sup)	Verify cable does not fail AT-010, or protect cable in this compartment
	F100-A08D	I	Support AOV AT-010	Fail AOV AT-010 (AF TDP PP01B Stm Sup)	Verify cable does not fail AT-010, or protect cable in this compartment
	F120-A09D	I	Support AOV AT-010	Fail AOV AT-010 (AF TDP PP01B Stm Sup)	Verify cable does not fail AT-010, or protect cable in this compartment
	F157-A17C	I	Support AOV AT-010	Fail AOV AT-010 (AF TDP PP01B Stm Sup)	Verify cable does not fail AT-010, or protect cable in this Div. "A" FC
CCMVT3B-026	FK-K01	C	Support CC HX HE03B Disch Vlv CC-026	Fail to open CC-026 fails CC HX HE03B	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
DCBCY-D-BC01D	F157-A17C	I	Support 1E 125VDC Batt. Chgr. BC01D	Fail 1E 125VDC Batt. Chgr. BC01D	Verify cable does not fail BC01D, or protect in this Div. "A" FC
DCBSY-M-MC01M	F120-AGAD	I	Support non-1E 125VDC Bus MC01M	Fail non-1E 125VDC Bus MC01M	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
F-CC-MV-021-OC	F120-AGAC	I	CC HX HE01A Disch MOV	Spurious close fails CC HX HE01A	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
F-CC-MV-022-OC	FK-K01	C	Support CC HX HE01B Disch Vlv CC-022	Spurious close CC-022 fails CC HX HE01B	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
F-CC-MV-023-OC	F120-AGAC	I	CC HX HE02A Disch MOV	Spurious close fails CC HX HE02A	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
F-CC-MV-024-OC	FK-K01	C	Support CC HX HE02B Disch Vlv CC-024	Spurious close CC-024 fails CC HX HE02B	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
F-CC-MV-027-CO	F120-AGAC	I	"A" CC HX Bypass MOV	Spurious open bypasses all "A" CC HXs	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
F-CC-MV-028-CO	FK-K01	C, P	Support B CC HX Bypass Vlv CC-028	Spurious open CC-028 fails all B CC HXs	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
F-EF-PA03B-INV	F000-ADGD	C, C	Failure of PA-03B	Various, but TD AF PP01A Mod Vlv AF-037	Verify cables do not fail AF-037, re-route cable out of this FC, or protect cable in this FC
F-EF-PA03B-MCC	F000-ADGD	C, C	Failure of PA-03B	Various, but TD AF PP01A Mod Vlv AF-037	Verify cables do not fail AF-037, re-route cable out of this FC, or protect cable in this FC

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Table 2 – Removed Fire PRA Cables (by Component Basic Event)

Component Basic Event	FC	Cable Type	Function	Potential Failure Mode	Exclusion Criteria
F-EF-PA21-FAIL	F000-ACVU	C, I	Relay and Metering Panel PA-21	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
	F100-A08D	C	Relay and Metering Panel PA-21	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
	F120-AGAA	C, I	Relay and Metering Panel PA-21	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
	F120-AGAC	C, C, C, I, I, I	Relay and Metering Panel PA-21	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
	F120-AGAD	C, C, C	Relay and Metering Panel PA-21	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
	F137-A11D	C	Relay and Metering Panel PA-21	Spurious operation failing UATs TR01M & N	Either verify cable failure does not fail UATs, or protect cable in FC
F-EF-PA22-FAIL	F000-ACVU	I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	F100-A05D	C	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	F100-A06D	C	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	F100-A08D	C	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	F120-A01C	C	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	F120-A05C	C, I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	F120-A05D	C, I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	F120-A08C	I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	F120-A09C	I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	F120-AGAA	I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
	F120-AGAC	I, I, I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC

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Table 2 – Removed Fire PRA Cables (by Component Basic Event)

Component Basic Event	FC	Cable Type	Function	Potential Failure Mode	Exclusion Criteria
	F120-AGAD	I	Relay and Metering Panel PA-22	Spurious operation failing SATs TR02M & N	Either verify cable failure does not fail SATs, or protect cable in FC
F-FW-HV-131-OC	F120-AGAC	I	SG 1 Downcomer Line FWIV	Fail SUFW to SG 1	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
F-FW-HV-133-OC	F000-ADGC	I	SUFW to SG2	Spurious closing of valve FW-0133	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
	F120-AGAC	I	SG 2 Downcomer Line FWIV	Fail SUFW to SG 2	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
FWMVO-N-104	F000-ADGC	I, I	SUFW to SG2	Surrogate for spurious opening of FW-0123	Ensure SUFW flow to normal FW line is not a flow diversion, or protect cable in FC
MSAVO-A-109	F000-ADGC	I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	F120-A14A	C, I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	F120-AGAA	C, C, I, I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	F120-AGAC	I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
	F120-AMPB	C	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
	F137-A01C	I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
	F157-A25C	I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	F157-AMAX	I, I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	F157-ATOC	I	Steam supply to TD AF PP01B	AOV MS-109 fails to open on demand	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
MSAVO-B-110	F120-A11B	C	Steam supply to TD AF PP01A	AOV MS-110 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
	F120-A15B	C	Steam supply to TD AF PP01A	AOV MS-110 fails to open on demand	Verify cables do not fail valve, re-route cable out of this FC, or protect cable in this FC
	F120-AGAC	I	Steam supply to TD AF PP01A	AOV MS-110 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC

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Table 2 – Removed Fire PRA Cables (by Component Basic Event)

Component Basic Event	FC	Cable Type	Function	Potential Failure Mode	Exclusion Criteria
	F120-AGAD	C	Steam supply to TD AF PP01A	AOV MS-110 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
	F120-AMPB	C	Steam supply to TD AF PP01A	AOV MS-110 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
	F157-A01D	I	Steam supply to TD AF PP01A	AOV MS-110 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
	F157-ACPX	I, I	Steam supply to TD AF PP01A	AOV MS-110 fails to open on demand	Verify cable does not fail valve, re-route cable out of this FC, or protect cable in this FC
MSMVT-B-105	F120-AGAC	I	SG 1 MS ADV Block Valve MS-105	Spurious close blocks ADV MS-101 flow path	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
MSMVT-D-108	F120-AGAC	I	SG 2 MS ADV Block Valve MS-108	Spurious close blocks ADV MS-104 flow path	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
	F157-A25C	I	SG 2 MS ADV Block Valve MS-108	Spurious close blocks ADV MS-104 flow path	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
NBBSY-S-SW03N	F000-TB	I, I, I, I	Non-1E 4.16KV SWGR 3-SW03N	Fail AAC to SW01A/B/C/D	Either verify cable failures do not fail 3-SW03N, or protect cables in FC
	F067-T02	I, I	Non-1E 4.16KV SWGR 3-SW03N	Fail AAC to SW01A/B/C/D	Either verify cable failures do not fail 3-SW03N, or protect cables in FC
	F073-T11	I, I	Non-1E 4.16KV SWGR 3-SW03N	Fail AAC to SW01A/B/C/D	Either verify cable failures do not fail 3-SW03N, or protect cables in FC
	F137-A05D	I, I	Non-1E 4.16KV SWGR 3-SW03N	Fail AAC to SW01A/B/C/D	Either verify cable failures do not fail 3-SW03N, or protect cables in FC
	F157-ACPX	I, I	Non-1E 4.16KV SWGR 3-SW03N	Fail AAC to SW01A/B/C/D	Either verify cable failures do not fail 3-SW03N, or protect cables in FC
NGBSY3N-LC19N	F000-AFHU	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)
	F000-TB	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)
	F067-T02	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)
	F078-A47B	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)
	F100-A05D	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)

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Table 2 – Removed Fire PRA Cables (by Component Basic Event)

Component Basic Event	FC	Cable Type	Function	Potential Failure Mode	Exclusion Criteria
	F100-A06D	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)
	F100-A10B	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)
	F100-A37B	P	Support various AAC loads	Failure of LC-19N	Cable does not damage 824-E-LC19N (Need to verify, or protect)
NPXHY-M-SAT02M	F073-T11	C, P	Support SAT TR02M	Fail SAT TR02M	Either verify cable failures do not fail SAT 02M, or protect cable in FC
	F078-AGAC	P	Support SAT TR02M	Fail SAT TR02M	Either verify cable failures do not fail SAT 02M, or protect cable in FC
	F120-A05D	C	Support SAT TR02M	Fail SAT TR02M	Verify existing cable protection (conduit) prevents spurious failure of SAT-02M, or protect cable in this FC
NPXHY-M-UAT01M	F000-ACVU	C, I	Support UAT TR01M	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
	F120-A05D	C, I	Support UAT TR01M	Spurious operation failing UATs TR01M & N	Verify existing cable protection (conduit) prevents spurious failure of UAT-01M, or protect cable in this FC
	F120-AGAA	C, I	UAT TR01M	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
	F120-AGAC	C, C, C, I, I, I	UAT TR01M	Spurious operation failing UATs TR01M & N	Either verify cable failures do not fail UATs, or protect cables in FC
	F120-AGAD	I	Support UAT TR01M	Spurious operation failing UATs TR01M & N	Verify cable is fiber optic (i.e., no SO), or protect cable in FC
NPXHY-N-SAT02N	F073-T11	C, P	Support SAT TR02N	Fail SAT TR02N	Either verify cable failures do not fail SAT 02N, or protect cable in FC
	F078-AGAD	P	Support SAT TR02N	Fail SAT TR02N	Either verify cable failures do not fail SAT 02N, or protect cable in FC
	F120-A05D	C	Support SAT TR02N	Fail SAT TR02N	Verify existing cable protection (conduit) prevents spurious failure of SAT-02N, or protect cable in this FC
	F120-AGAD	C, C, C	Support SAT TR02N	Fail SAT TR02N	Verify cables in individual conduit precluding SO failures of SAT 02N, or protect cables in FC

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Table 2 – Removed Fire PRA Cables (by Component Basic Event)

Component Basic Event	FC	Cable Type	Function	Potential Failure Mode	Exclusion Criteria
	F137-A11D	C	Support SAT TR02N	Fail SAT TR02N	Verify cable in individual conduit precluding SO failure of SAT 02N, or protect cable in FC
NPXHY-N-UAT01N	F120-A05D	C, I	Support UAT TR01N	Spurious operation failing UATs TR01M & N	Verify existing cable protection (conduit) prevents spurious failure of UAT-01N, or protect cable in this FC
	F120-AGAD	C, C, C, I, I, I	Support UAT TR01N	Spurious operation failing UATs TR01M & N	Verify "C" cables in conduit & "I" cables are FO both precluding SO failures, or protect cables in FC
	F137-A11D	C	Support UAT TR01N	Spurious operation failing UATs TR01M & N	Verify cable in individual conduit precluding SO failure of UAT 01N, or protect cable in FC
PELXY-A-LX09A-P	F078-A04C	C	Support primary loop controller LX09A	Fail AOV MS-109 (TDP PP01B Stm Sup)	Verify this "A" cable does not fail AF TPP PP01B steam valve MS-109, or protect cable in this FC
	F120-A14A	C, C	Support primary loop controller LX09A	Fail AOV MS-109 (TDP PP01B Stm Sup)	Verify this "A" cable does not fail AF TPP PP01B steam valve MS-109, or protect cable in this FC
	F120-AGAA	C, C, C, C	Support primary loop controller LX09A	Fail AOV MS-109 (TDP PP01B Stm Sup)	Verify this "A" cable does not fail AF TPP PP01B steam valve MS-109, or protect cable in this FC
	F120-AGAC	C	Support primary loop controller LX09A	Fail AOV MS-109 (TDP PP01B Stm Sup)	Verify this "A" cable does not fail AF TPP PP01B steam valve MS-109, or protect cable in this FC
PELXY-B-LX06B-P	F120-AGAD	C	Support primary loop controller LX06B	Fail control of breaker SW01D-J2	Verify cables do not fail SW01D-J2, or protect cables in this compartment
PELXY-B-LX11B-P	F078-A04D	C	Support primary loop controller LX11B	Fail AOV MS-110 (TDP PP01A Stm Sup)	Verify this "B" cable does not fail AF TPP PP01A steam valve MS-110 or protect cable in this FC
	F120-A15B	C, C	Support primary loop controller LX11B	Fail AOV MS-110 (TDP PP01A Stm Sup)	Verify these "B" cables do not fail AF TPP PP01A steam valve MS-110 or protect cables in this FC
	F120-AGAD	C	Support primary loop controller LX11B	Fail AOV MS-110 (TDP PP01A Stm Sup)	Verify this "B" cable does not fail AF TPP PP01A steam valve MS-110 or protect cable in this FC
	F120-AMPB	C	Support primary loop controller LX11B	Fail AOV MS-110 (TDP PP01A Stm Sup)	Verify this "B" cable does not fail AF TPP PP01A steam valve MS-110 or protect cable in this FC
PELXY-C-LX04C-P	F078-AGAC	C	Support primary loop controller LX04C	Fail MOV AF-045	Verify cable does not fail AF-045, or protect cable in this compartment
PFBSY1A-SW01A	F078-A04C	C, P	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables are only for sync circuit breaker, and do not fail SW01A (NOTE: no impact if included)
	F078-A19A	C, I	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables do not fail SW01A, or protect cables in this compartment

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Table 2 – Removed Fire PRA Cables (by Component Basic Event)

Component Basic Event	FC	Cable Type	Function	Potential Failure Mode	Exclusion Criteria
	F078-AGAC	C	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables do not fail SW01A, re-route, or protect cables in this compartment
	F100-A05D	C	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables are only for fault recorder, and do not fail SW01A, or protect cable in this FC
	F100-A06D	C	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables are only for fault recorder, and do not fail SW01A, or protect cable in this FC
	F100-A08C	C	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables are only for fault recorder, and do not fail SW01A, or protect cable in this FC
	F120-A05D	C	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables are only for fault recorder, and do not fail SW01A, or protect cable in this FC
	F120-AGAC	C, I	Support 1E 4KV SWGR SW01A	Fail SW01A	Verify cables do not fail SW01A, or protect cables in this compartment
PFBSY1B-SW01B	F078-A02D	C	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cable is only for sync circuit breaker, and does not fail SW01B (NOTE: no impact if included)
	F078-A04D	C, P	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cables are only for sync circuit breaker, and do not fail SW01B (NOTE: no impact if included)
	F078-A19B	I	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cable does not fail SW01B, or protect cable in this compartment
	F078-AGAD	I	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cables do not fail SW01B, re-route, or protect cables in this compartment
	F100-A05D	C	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cables are only for fault recorder, and do not fail SW01B, or protect cable in this FC
	F100-A06D	C, I	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cables are only for fault recorder, and do not fail SW01B, or protect cable in this FC
	F100-A08D	C	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cables are only for fault recorder, and do not fail SW01B, or protect cable in this FC
	F120-A01D	C	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cables are only for sync circuit breaker, and do not fail SW01B (NOTE: no impact if included)
	F120-A05D	C	Support 1E 4KV SWGR SW01B	Fail SW01B	Verify cables are only for fault recorder, and do not fail SW01B, or protect cable in this FC
	F120-AGAD	C, I	Support 1E 4KV SWGR SW01B	Fail SW01B	Either verify cable failures do not fail SW01B, or protect cables in FC
PFBSY2A-SW01C	F078-A03C	C	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cable is only for sync circuit breaker, and does not fail SW01C (NOTE: no impact if included)

Response to Action Item 19-51 Section 19.1

Table 2 – Removed Fire PRA Cables (by Component Basic Event)

Component Basic Event	FC	Cable Type	Function	Potential Failure Mode	Exclusion Criteria
	F078-A19A	C, I	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cables do not fail SW01C, or protect cables in this compartment
	F078-AGAC	C, C, I, I, I	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cables do not fail SW01C, re-route, or protect cables in this compartment
	F100-A05D	C	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cables are only for fault recorder, and do not fail SW01C, or protect cable in this FC
	F100-A06D	C	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cables are only for fault recorder, and do not fail SW01C, or protect cable in this FC
	F100-A08C	C	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cables are only for fault recorder, and do not fail SW01C, or protect cable in this FC
	F120-A05D	C	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cables are only for fault recorder, and do not fail SW01C, or protect cable in this FC
	F120-AGAC	C, I	Support 1E 4KV SWGR SW01C	Fail SW01C	Verify cables do not fail SW01C, or protect cables in this compartment
PFBSY2B-SW01D	F078-A03D	C, C, P, P	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables are only for sync circuit breaker, and do not fail SW01D (NOTE: no impact if included)
	F078-A05D	C, C, P, P	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables are only for sync circuit breaker, and do not fail SW01D (NOTE: no impact if included)
	F078-A11D	C, C	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cable does not fail SW01D, or protect cable in this compartment
	F078-A19B	I, I	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables do not fail SW01D, or protect cables in this compartment
	F078-AEEB	C, I, C, I	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables do not fail SW01D, or protect cables in this compartment
	F078-AGAD	C, I, C, I	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables do not fail SW01D, re-route, or protect cables in this compartment
	F100-A05D	C	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables are only for fault recorder, and do not fail SW01D, or protect cable in this FC
	F100-A06D	C, C	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables are only for fault recorder, and do not fail SW01D, or protect cable in this FC
	F100-A08D	C, C	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables are only for fault recorder, and do not fail SW01D, or protect cable in this FC
	F120-A01D	C	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables are only for sync circuit breaker, and do not fail SW01D (NOTE: no impact if included)

Response to Action Item 19-51 Section 19.1

Table 2 – Removed Fire PRA Cables (by Component Basic Event)

Component Basic Event	FC	Cable Type	Function	Potential Failure Mode	Exclusion Criteria
	F120-A05D	C, C	Support 1E 4KV SWGR SW01D	Fail SW01D	Verify cables are only for fault recorder, and do not fail SW01D, or protect cable in this FC
	F120-AGAD	C, C, I, I	Support 1E 4KV SWGR SW01D	Fail SW01D	Either verify cable failures do not fail SW01D, or protect cables in FC
PFHBC1A-SW01A-G2	F100-A08C	C	SW01A AAC Supply Breaker	Fail SW01A-G2	Verify cables are only for fault recorder, and do not fail SW01A-G2, or protect cable in this FC
PFHBC1B-SW01B-A2	F120-AGAD	I, I	SW01B SAT Supply Breaker	Prevent SW01B SAT breaker from operating	Verify cables do not fail SW01B-J2, or protect cables in this compartment
PFHBC1B-SW01B-B2	F100-A05D	C	SW01B AAC Supply Breaker	Fail SW01B-B2	Verify cables are only for fault recorder, and do not fail SW01B-B2, or protect cable in this FC
	F100-A06D	C	SW01B AAC Supply Breaker	Fail SW01B-B2	Verify cables are only for fault recorder, and do not fail SW01B-B2, or protect cable in this FC
PFHBC1B-SW01B-D2	F100-A06D	C	SW01B EDG Supply Breaker	Fail SW01B-D2	Verify cables are only for fault recorder, and do not fail SW01B-D2, or protect cable in this FC
PFHBC2A-SW01C-E2	F000-TB	C, C	4kV SWGR SW01C breaker E2	Prevent SW01C from being powered from AAC	Either verify cable failure does not prevent AAC supply to SW01C, or protect cable in FC
	F067-T02	C, P	SW01C AAC Supply Breaker	Fail AAC to SW01C	Either verify cable failures do not fail breaker SW01C-E2, or protect cable in FC
	F100-A08C	C	SW01C AAC Supply Breaker	Fail SW01C-E2	Verify cables are only for fault recorder, and do not fail SW01C-E2, or protect cable in this FC
	F100-A05D	C	SW01D AAC Supply Breaker	Fail SW01D-E2	Verify cables are only for fault recorder, and do not fail SW01D-E2, or protect cable in this FC
	F100-A06D	C, C	SW01D AAC Supply Breaker	Fail SW01D-E2	Verify cables are only for fault recorder, and do not fail SW01D-E2, or protect cable in this FC
PFHBC2B-SW01D-J2	F078-AGAD	C	SW01D SAT Supply Breaker	Prevent SW01D SAT breaker from operating	Verify cables do not fail SW01D-J2, or protect cables in this compartment
	F120-AGAD	I, I	SW01D SAT Supply Breaker	Prevent SW01D SAT breaker from operating	Verify cables do not fail SW01D-J2, or protect cables in this compartment
PFHBO1A-SW01A-H2	F100-A05D	C	SW01A UAT Supply Breaker	Fail SW01A-H2	Verify cables are only for fault recorder, and do not fail SW01A-H2, or protect cable in this FC
	F100-A06D	C	SW01A UAT Supply Breaker	Fail SW01A-H2	Verify cables are only for fault recorder, and do not fail SW01A-H2, or protect cable in this FC

Response to Action Item 19-51 Section 19.1

Table 2 – Removed Fire PRA Cables (by Component Basic Event)

Component Basic Event	FC	Cable Type	Function	Potential Failure Mode	Exclusion Criteria
	F100-A08C	C	SW01A UAT Supply Breaker	Fail SW01A-H2	Verify cables are only for fault recorder, and do not fail SW01A-H2, or protect cable in this FC
	F120-A05D	C	SW01A UAT Supply Breaker	Fail SW01A-H2	Verify cables are only for fault recorder, and do not fail SW01A-H2, or protect cable in this FC
PFHBO1B-SW01B-H2	F100-A05D	C	SW01B UAT Supply Breaker	Fail SW01B-H2	Verify cables are only for fault recorder, and do not fail SW01B-H2, or protect cable in this FC
	F100-A06D	C	SW01B UAT Supply Breaker	Fail SW01B-H2	Verify cables are only for fault recorder, and do not fail SW01B-H2, or protect cable in this FC
	F120-A05D	C	SW01B UAT Supply Breaker	Fail SW01B-H2	Verify cables are only for fault recorder, and do not fail SW01B-H2, or protect cable in this FC
	F120-AGAD	I	SW01B UAT Supply Breaker	Prevent SW01B UAT breaker from operating	Verify cables do not fail SW01B-H2, or protect cables in this compartment
PFHBO2A-SW01C-C2	F100-A05D	C	SW01C UAT Supply Breaker	Fail SW01C-C2	Verify cables are only for fault recorder, and do not fail SW01C-C2, or protect cable in this FC
	F100-A06D	C	SW01C UAT Supply Breaker	Fail SW01C-C2	Verify cables are only for fault recorder, and do not fail SW01C-C2, or protect cable in this FC
	F100-A08C	C	SW01C UAT Supply Breaker	Fail SW01C-C2	Verify cables are only for fault recorder, and do not fail SW01C-C2, or protect cable in this FC
	F120-A05D	C	SW01C UAT Supply Breaker	Fail SW01C-C2	Verify cables are only for fault recorder, and do not fail SW01C-C2, or protect cable in this FC
PFHBO2B-SW01D-G2	F078-AGAD	C	SW01D UAT Supply Breaker	Prevent SW01D UAT breaker from operating	Verify cables do not fail SW01D-G2, or protect cables in this compartment
	F100-A05D	C	SW01D UAT Supply Breaker	Fail SW01D-G2	Verify cables are only for fault recorder, and do not fail SW01D-G2, or protect cable in this FC
	F100-A06D	C	SW01D UAT Supply Breaker	Fail SW01D-G2	Verify cables are only for fault recorder, and do not fail SW01D-G2, or protect cable in this FC
	F120-A05D	C	SW01D UAT Supply Breaker	Fail SW01D-G2	Verify cables are only for fault recorder, and do not fail SW01D-G2, or protect cable in this FC
	F120-AGAD	I	SW01D UAT Supply Breaker	Prevent SW01D UAT breaker from operating	Verify cables do not fail SW01D-G2, or protect cables in this compartment
PGBSY1B-LC01B	F120-AGAD	C, C, I, I	Support 1E 480V LC LC01B	Fail LC01B	Either verify cable failures do not fail LC01B, or protect cables in FC
PGBSY2A-LC01C	F078-AGAC	C, C	Support 480V LC01C	Fail LC01C	Verify cables do not fail LC01C, re-route, or protect cables in this compartment

Response to Action Item 19-51 Section 19.1

Table 2 – Removed Fire PRA Cables (by Component Basic Event)

Component Basic Event	FC	Cable Type	Function	Potential Failure Mode	Exclusion Criteria
	F120-AGAC	I, I	Support 480V LC01C	Fail LC01C	Verify cables do not fail LC01C, or protect cables in this compartment
PGBSY2B-LC01D	F120-AGAD	I, I	Support 1E 480V LC LC01D	Fail LC01D	Either verify cable failures do not fail LC01D, or protect cables in FC
PHBSY1B-MC02B	FK-K01	P	Support 480VAC MCC MC02B	Fail B SX Pump Rm Cooling Fan AH01B	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
RCMVO-A-130	F157-A25C	I	Support RC-200 Pilot Valve RC-130	Fail POSRV RC-200	Verify cable does not fail RC-130, or protect cable in this compartment
RCMVO-A-132	F157-A25C	I	Support RC-201 Pilot Valve RC-132	Fail POSRV RC-201	Verify cable does not fail RC-132, or protect cable in this compartment
RCMVO-C-131	F157-A25C	I	Support RC-200 Pilot Valve RC-131	Fail POSRV RC-200	Verify cable does not fail RC-131, or protect cable in this compartment
RCMVO-C-133	F157-A25C	I	Support RC-201 Pilot Valve RC-133	Fail POSRV RC-201	Verify cable does not fail RC-133, or protect cable in this compartment
RCPVO-A-200	F157-A25C	I	Support POSRV RC-200	Fail POSRV RC-200	Verify cable does not fail RC-200, or protect cable in this compartment
RPIAT-A-PY102A	F000-C01	I, I	Support RC-PT-201A	Failure of input trip signal to LCL processor A (1/4)	Effectively separate cables or protect cables in this FC
RPIAT-B-PY102B	F000-C01	I	Support RC-PT-201B	Failure of input trip signal to LCL processor A (1/4)	Effectively separate cables or protect cables in this FC
RPIAT-C-PY102C	F000-C01	I, I	Support RC-PT-201C	Failure of input trip signal to LCL processor A (1/4)	Effectively separate cables or protect cables in this FC
RPIAT-D-PY102D	F000-C01	I	Support RC-PT-201D	Failure of input trip signal to LCL processor A (1/4)	Effectively separate cables or protect cables in this FC
SXAHR-B-AH01B	F050-A04A	C, C	"B" SX Cooling Tower Fan 1B	Fail "B" SX Cooling Tower Fan 1B	Verify cables are not in this FC, cables do not fail SX AH01B, or protect cable in FC
	F078-A02C	C, C	"B" SX Cooling Tower Fan 1B	Fail "B" SX Cooling Tower Fan 1B	Verify cables are not in this FC, cables do not fail SX AH01B, or protect cable in FC
	F078-A25A	C, C	"B" SX Cooling Tower Fan 1B	Fail "B" SX Cooling Tower Fan 1B	Verify cables are not in this FC, cables do not fail SX AH01B, or protect cable in FC
	F078-AGAC	C, C	"B" SX Cooling Tower Fan 1B	Fail "B" SX Cooling Tower Fan 1B	Verify cables are not in this FC, cables do not fail SX AH01B, or protect cable in FC

Response to Action Item 19-51 Section 19.1

Table 2 – Removed Fire PRA Cables (by Component Basic Event)

Component Basic Event	FC	Cable Type	Function	Potential Failure Mode	Exclusion Criteria
	F078-AGAD	P, P	"B" SX Cooling Tower Fan 1B	Fail "B" SX Cooling Tower Fan 1B	Verify cables do not fail SX AH01B, or protect cable in FC
SXAHR-B-AH02B	F050-A04A	C, C	"B" SX Cooling Tower Fan 2B	Fail "B" SX Cooling Tower Fan 2B	Verify cables are not in this FC, cables do not fail SX AH02B, or protect cable in FC
	F078-A02C	C, C	"B" SX Cooling Tower Fan 2B	Fail "B" SX Cooling Tower Fan 2B	Verify cables are not in this FC, cables do not fail SX AH02B, or protect cable in FC
	F078-A25A	C, C	"B" SX Cooling Tower Fan 2B	Fail "B" SX Cooling Tower Fan 2B	Verify cables are not in this FC, cables do not fail SX AH02B, or protect cable in FC
	F078-AGAC	C, C	"B" SX Cooling Tower Fan 2B	Fail "B" SX Cooling Tower Fan 2B	Verify cables are not in this FC, cables do not fail SX AH02B, or protect cable in FC
	F078-AGAD	P, P	"B" SX Cooling Tower Fan 2B	Fail "B" SX Cooling Tower Fan 2B	Verify cables do not fail SX AH02B, or protect cable in FC
SXFMY1B-FT01B-MOTOR	F050-A04A	C	"B" SX Debris Filter 1B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT01B, or protect cable in FC
	F078-A25A	C	"B" SX Debris Filter 1B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT01B, or protect cable in FC
	F078-AGAC	C	"B" SX Debris Filter 1B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT01B, or protect cable in FC
SXFMY2B-FT02B-MOTOR	F050-A04A	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC
	F078-A02C	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC
	F078-A25A	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC
	F078-AGAC	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC
SXFMY3B-FT03B-MOTOR	F050-A04A	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC
	F078-A02C	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC
	F078-A25A	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC
	F078-AGAC	C	"B" SX Debris Filter 2B	Fail 2B CC HX given filter plugging	Verify cable is not in this FC, cable does not fail SX FT02B, or protect cable in FC

Response to Action Item 19-51 Section 19.1

Table 2 – Removed Fire PRA Cables (by Component Basic Event)

Component Basic Event	FC	Cable Type	Function	Potential Failure Mode	Exclusion Criteria
SXMVR-B-MV073	FK-K01	C	Support SXCT Fan Sup Valve SX-073	Spurious close fails flow to Div. B SXCT Fans	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
SXMVR-B-MV074	FK-K01	C	Support SXCT Fan Byp Valve SX-073	Spurious open diverts flow from Div. B SXCT Fans	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
SXMVT2B-048	FK-K01	C, P	Support SX Pp 2B disch MOV SX-048	Spurious close of SX-048 fails SX Pp 2B	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
VGAHR1B-AH01B	FK-K01	C, C, C, P, P, P	Support ESW Pump Rm Sup Fan AH01B	Fail ESW Pump Rm Sup Fan AH01B	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02
VGAHR2B-AH02B	FK-K01	C, C, P, P	Support ESW Pump Rm Sup Fan AH02B	Fail ESW Pump Rm Sup Fan AH02B	Moved these Div. B cables to Div. B ESW Pump Rm FK-K02

Response to Action Item 19-52 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-52 (AI 19-52)

DCD Page 19.1-221 states, "No fires were identified that can fail both divisions of safety equipment without conditional failure of a fire barrier." This risk insight was identified for the LPSD fire analysis but not for at-power fire analysis.

Response

The insight is applicable to full power fire as well as for the LPSD. The insight was meant to include all plant areas except the Main Control Room (MCR) and the reactor containment building as these are obvious areas where equipment from both divisions exist. This insight will be added to the Key Risk Insights section for full power fires (19.1.5.2.2.5), and will be clarified in the Key Risk Insights section for LPSD fires (19.1.6.3.2.5).

At-power Fire Risk Insight in Section 19.1.5.2.2.5 a. will be revised to add the insight that no fires were identified that can fail both divisions of safety equipment without conditional failure of a fire barrier with the exception of the Main Control Room and the Reactor Containment Building (See Attachment 1). LPSD Fire Risk Insight in Section 19.1.6.3.2.5 a. will be revised to note that the Main Control Room and the Reactor Containment Building are exceptions to the risk insight (See Attachment 2).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment 1 – Section 19.1.5.2.2.5 DCD Markup for Question PRA-52

19.1.5.2.2.5 Risk Insights

The APR1400 design features that promote reduced fire risk are as follows.

a. The design has two divisions each consisting of two trains of safety systems. Each division is segregated with physical fire barriers to protect the safety function of safety systems from fires impacting the opposite division. With the exception of the Main Control Room and Reactor Containment Building, no fires were identified that can fail both divisions of safety equipment without the conditional failure of a fire barrier.

APR1400 DCD TIER 2

Attachment 2 – Section 19.1.6.3.2.5 DCD Markup for Question PRA-52

19.1.6.3.2.5 Risk Insights

The APR1400 design features that promote reduced LPSD fire risk are as follows:

a. The design has two divisions, each consisting of two trains of safety systems. Each division is segregated with physical fire barriers, protecting the safety function of safety systems from fires impacting the opposite division. ~~No~~ With the exception of the Main Control Room and Reactor Containment Building, no fires were identified that can fail both divisions of safety equipment without the conditional failure of a fire barrier.

Response to Action Item 19-61 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-61 (AI 19-61)

Section 19.1.4.1.1.1, it is unclear why initiating events in Table 19.1-5 lists only 4 initiating event types, when Table 19.1-6 identifies more than 4 initiating events.

Response

Per the text in Section 19.1.4.1.1.1, the information in Table 19.1-5 is for initiating event types (i.e., general initiating event categories such as LOCAs, transients, etc.), and the information in Table 19.1-6 is for internal events initiating event. However, the title in Table 19.1-5 does not specify that this is for initiating event types; therefore, the title of Table 19.1-5 is revised to reflect that this is for initiating event types (See Attachment).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Table 19.1-5 DCD Markup for Question PRA-61

Table 19.1-5 (1 of 2)

Relation of the Plant Safety Functions and the Initiating Event Types

Initiator Type	Impact on Core Performance Functions				Impact on Plant System Performance	Level 2 Analysis Considerations
	Reactivity Control	RCS Pressure Control	RCS Inventory Control	RCS Heat Removal		
LOCAs	None; LOCAs followed by reactor protection system (RPS) failure are grouped under the ATWS category.	None; the LOCA will depressurize the RCS eliminating potential to exceed upper RCS design pressure limit. RCS inventory control response will provide necessary lower limit pressure control.	Major impact. LOCA break size dictates the amount of RCS makeup required to ensure that the reactor core is covered.	Potential Major impact, depending on the break size and the occurrence of transient induced LOCAs. For medium and large LOCAs, the systems used to provide RCS inventory control are also used for RCS heat removal.	Potential major impact, depending on the location of the LOCA. LOCAs in SI or SC injection piping will partially fail these systems. ISLOCAs may fail plant systems due to dynamic effects (e.g., pipe whip) or steam flooding.	LOCAs are subdivided according to their ability to bypass the containment: • No bypass • Bypass - ISLOCAs - SGTRs

Response to Action Item 19-62 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-62 (AI 19-62)

What qualitative evaluation is performed for each potential initiating events identified to assess applicability to APR1400 as stated in Section 19.1.4.1.1.1?

Response

Per paragraphs 2 and 3 of Section 19.1.4.1.1.1, a list of potential initiators is developed from review of design basis events, beyond design basis events, generic lists of industry events, a review of plant specific system and design features, system interfaces, spatial interactions and CCF potentials. The evaluation is a qualitative evaluation regarding whether each potential initiator would result in an initiating event as defined in paragraph 1 of Section 19.1.4.1.1.1; the DCD is revised to reflect this (See Attachment).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Section 19.1.4.1.1.1 DCD Markup for Question PRA-62

[Section 19.1.4.1.1.1., page 19.1-36]

A thorough and systematic search is performed to define the spectrum of initiating events that could occur at an APR1400 plant. This list of accidents includes both design basis events (e.g., LOCAs, SGTR, and LOOP), as well as beyond design basis events (e.g., ATWS and SBO).

Potential initiating events are identified based on generic industry lists of initiating events, review of plant-specific system and design features, system interfaces, spatial interactions, and CCF potentials. For each of the potential initiating events identified, a qualitative evaluation- regarding whether each potential initiator would result in an initiating event as defined in the first paragraph of this section is performed to assess the applicability of the event to the APR1400 design.

New initiators unique to the APR1400 design are also identified. Initiating events that are the result of support system failures or transients, called special initiators, are also considered through review of the existing design information.

Response to Action Item 19-64 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-64 (AI 19-64)

Section 19.1.4.1.1.1, what new initiators unique to APR1400 were identified?

Response

Although a search of unique initiators, including a review for special initiators, was made during the searches and reviews discussed in Section 19.1.4.1.1.1, no initiators unique to the APR1400 were identified. Section 19.1.4.1.1.1 of the DCD is revised to more accurately state this fact (See Attachment).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Section 19.1.4.1.1.1 DCD Markup for Question PRA-64

[Section 19.1.4.1.1.1, page 10.1-36]

A thorough and systematic search is performed to define the spectrum of initiating events that could occur at an APR1400 plant. This list of accidents includes both design basis events (e.g., LOCAs, SGTR, and LOOP), as well as beyond design basis events (e.g., ATWS and SBO).

Potential initiating events are identified based on generic industry lists of initiating events, review of plant-specific system and design features, system interfaces, spatial interactions, and CCF potentials. For each of the potential initiating events identified, a qualitative evaluation is performed to assess the applicability of the event to the APR1400 design.

~~New initiators unique to the APR1400 design are also identified.~~ Initiating events that are the result of support system failures or transients, called special initiators, are also considered through review of the existing design information for all APR1400 support systems. These special initiators are important as they both cause an initiating event and fail a support system required to mitigate the initiator. Systems can be screened if they do not result in a plant trip. Systems which may cause a plant trip, but do not support any mitigation system are considered to be included in the general transient initiating event frequency, and are therefore screened as special initiators. Special initiators which were not screened, and hence are included as a special initiator are loss of instrument air (LOIA), and both partial and total losses of either the component cooling system (PLOCCW and TLOCCW) or the essential service water system (PLOESW and TLOESW).

Although a search of unique initiators was made during the searches and reviews described above, no initiators unique to the APR1400 were identified.

The list of potential initiating events is grouped into similar functional categories to reduce the complexity of the PRA. The initiating event frequency for each of these groups is then quantified.

Response to Action Item 19-65 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-65 (AI 19-65)

Section 19.1.4.1.1.1, what special initiators were considered and/or modeled?

Response

Section 19.1.4.1.1.1 is revised to indicate that all APR1400 support systems were considered as special initiators, and the modeled special initiators include loss of instrument air, and both partial and total losses of either the component cooling system or the essential service water system.

See Attachment of the response to Issue # PRA-64 (AI 19-64).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Response to Action Item 19-66 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-66 (AI 19-66)

Section 19.1.4.1.1.1, how were potential initiating events screened from consideration if the frequency was low?

Response

Section 19.1.4.1.1.1 (page 19.1-36) specifically describes the conditions where initiating events can be screened, and further states that no initiating events for the APR1400 PRA were screened based on frequency. There is no need to revise the DCD to re-state this.

Impact on DCD

There is no impact on the DCD.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Response to Action Item 19-67 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-67 (AI 19-67)

Section 19.1.4.1.1.1, what are the preliminary and final IE grouping definitions?

Response

The DCD is revised to point to the preliminary IE groups and the final IE groups (See Attachment 1).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Attachment 1 – Section 19.1.4.1.1.1 DCD Markup for Question PRA-67

[Section 19.1.4.1.1.1, bottom of Page 19.1-36]

No initiating events for the APR1400 PRA were screened based on frequency.

~~Once the i~~Initiating events are identified with broad preliminary definitions with respect to the impacts on the core protection functions (i.e., LOCAs, Secondary Pipe Breaks, Transients and ATWS events as shown in Table 19.1-5).~~, t~~ The final initiating event groups (Table 19.1-6) are developed with respect to the impacts noted in Table 19.1-5 (e.g., the amount of RCS inventory control is affected by the break size requiring that LOCAs be subdivided by break size)~~the final group definitions~~.

Response to Action Item 19-68 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-68 (AI 19-68)

Section 19.1.4.1.1.1, what are the existing nuclear power plants referenced?

Response

Although the APR1400 is a new design, many aspects are similar to existing pressurized water reactor (PWR) designs, specifically the C-E System 80, therefore information from existing plants is applicable to APR1400.

As the initiating events are generally similar to those of existing nuclear power plants (i.e., PWRs), the frequency for most initiating events are determined based on NRC generic estimates for current power plants (i.e., NUREG/CR-6928), which is cited as Reference 11 in Section 19.1.4.1.1.1.

Section 19.1.4.1.1.1 is revised as shown in Attachment.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Section 19.1.4.1.1.1 DCD Markup for Question PRA-68

[Section 19.1.4.1.1.1, page 19.1-37]

As these initiating events are similar to those of existing pressurized water reactor (PWR) nuclear power plants, the frequency for each initiating event is calculated based on generic estimates for current PWR power plants from references such as NUREG/CR-6928 (Reference 11).

Initiating events identified by this process, along with the frequencies and uncertainties of the events, are shown in Table 19.1-6. Initiating event development for the internal flooding model is described in Subsection 19.1.5.3, and initiating event development during low power and shutdown (LPSD) states is identified and evaluated in Subsection 19.1.6.

Response to Action Item 19-69 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-69 (AI 19-69)

Section 19.1.4.1.1.2, how is "postulated disturbance" used in this section?

Response

The phrase "postulated disturbance" means "initiating event."

Section 19.1.4.1.1.2 is revised as shown in Attachment.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Section 19.1.4.1.1.2 DCD Markup for Question PRA-69

[Section 19.1.4.1.1.2, page 19.1-37]

19.1.4.1.1.2 Accident Sequence Analysis

The accident sequences that result from the initiating events are modeled in the form of event trees. The event trees are time sequences that show the response of the plant to ~~a postulated disturbance~~an initiating event. The response is depicted as nodes that represent the non-safety and safety systems potential response or use. The model includes support systems and operator actions that either respond to the initiating events or mitigate failure of other systems (note that this detail may also be reflected in the system or functional fault trees).

Accident sequence development involves, for each functional initiating event category, defining the safety functions and the systems and operator actions that potentially are available to support each safety function included in the event trees. Event trees are developed that trace the event sequences from initiating event to end states. The event trees are defined in a manner that captures the diversity of plant responses and severity. Table 19.1-7 provides the list of event trees used.

Response to Action Item 19-70 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-70 (AI 19-70)

Section 19.1.4.1.1.2, multiple instances where the word potential is used to describe system response. Are the systems designed to respond or not?

Response

The systems are designed to respond; however, they may not respond, as the system may fail, or the system may be unavailable due to test and/or maintenance. Section 19.1.4.1.1.2 is revised to remove the word 'potential' as appropriate (See Attachments 1 and 2).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment 1 – Section 19.1.4.1.1.2 DCD Markup for Question PRA-70

[Section 19.1.4.1.1.2, Page 19.1-37]

19.1.4.1.1.2 Accident Sequence Analysis

The accident sequences that result from the initiating events are modeled in the form of event trees. The event trees are time sequences that show the response of the plant to a postulated disturbance. The response is depicted as nodes that represent the non-safety and safety systems ~~potential~~ response or use. The model includes support systems and operator actions that either respond to the initiating events or mitigate failure of other systems (note that this detail may also be reflected in the system or functional fault trees).

Accident sequence development involves, for each functional initiating event category, defining the safety functions and the systems and operator actions ~~that potentially are available~~needed to support each safety function included in the event trees. Event trees are developed that trace the event sequences from initiating event to end states. The event trees are defined in a manner that captures the diversity of plant responses and severity. Table 19.1-7 provides the list of event trees used.

Attachment 2 – Section 19.1.4.1.1.2 DCD Markup for Question PRA-70

[Section 19.1.4.1.1.2, bottom of page 19.1-39]

e. RCS heat removal – This function can be achieved by secondary heat removal to relieve steam and inject feedwater into the SGs. The feed and bleed operation may be able to perform this function.

f. Containment heat removal – This function is needed in those scenarios in which RCS heat is transferred to the containment, either due to a LOCA or due to use of the POSRVs.

For each initiating event, progression of ~~potential~~ scenarios leading to either a safe state or to core damage is modeled using an event tree. Functions required for mitigating the accident and for preventing core damage are included across the top of the event tree. Fault trees are used to quantify the probability of failure of each of the functions.

Response to Action Item 19-71 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-71 (AI 19-71)

Section 19.1.4.1.1.2, it is unclear how top events/gates were identified.

Response

Section 19.1.4.1.1.2 of the DCD describes this at a high level. Details of this analysis for each initiating event are contained in the Accident Sequence Analysis notebook, APR1400-K-P-NR-013102-P. However, the DCD is updated to more clearly state how top events are identified, and to state that the accident sequence analysis is consistent with the methodologies presented in NUREG/CR-2300 (See Attachment).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Section 19.1.4.1.1.2 DCD Markup for Question PRA-71

19.1.4.1.1.2 Accident Sequence Analysis

The accident sequences that result from the initiating events are modeled in the form of event trees. The event trees are time sequences that show the response of the plant to a postulated disturbance. The response is depicted as nodes that represent the non-safety and safety systems potential response or use. The model includes support systems and operator actions that either respond to the initiating events or mitigate failure of other systems (note that this detail may also be reflected in the system or functional fault trees).

~~A~~The accident sequence development is consistent with the methodology described in NUREG/CR-2300 (Reference 4).~~involves,~~ Top events for each of the initiating events identified in Section 19.1.4.1.1.1 are identified, by first determining~~defining~~ the required safety functions for the initiator (e.g., reactivity control is not required for LLOCA due to voiding in the core and the subsequent injection of borated water will keep the reactor subcritical; however, safety injection tank injection is required for initial inventory control, etc.), and then determining the systems and/or operator actions required to achieve ~~that potentially are available to support~~ each required safety function~~ included in the event trees~~. Event trees are developed that trace the event sequences from initiating event to end states depending upon the success or failure of each top event. The event trees are defined in a manner that captures the diversity of plant responses and severity. Table 19.1-7 provides the list of event trees used.

The success criteria for each event tree top event are defined in order to support the development of fault trees for the system functions and human reliability evaluations (for those top events that include operator actions); see Table 19.1-8.

Response to Action Item 19-73 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-73 (AI 19-73)

Section 19.1.4.1.1.2, it is unclear whether any unique trees were developed and how they would impact the results.

Response

For each initiating event, an event tree is developed to delineate the accident progression, and the systems and operator actions necessary for mitigating core damage. There were no unique initiators or unique circumstances identified which required a unique event tree. Details of the accident sequence analysis is developed and documented in the Accident Sequence Analysis Notebook APR1400-K-P-NR-013102-P.

The DCD is revised to remove the statement in Section 19.1.4.1.1.2 containing the term “unique tree”.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Section 19.1.4.1.1.2 DCD Markup for Question PRA-73

[Section 19.1.4.1.1.2, page 19.1-38]

The event sequence development begins, from a plant response perspective, with all equipment available and operating normally, and then progresses to display critical and important failure paths in a logical progression. Event depictions are left to right decisions in the time order of plant response.

~~An event tree based sequence modeling approach is used with each event type based upon the initiator being developed in a unique tree.~~ Safety functions necessary to achieve safe shutdown are modeled. Safety functions are derived from past PWR PRAs and from an evaluation of the plant response to the initiating event.

Event trees developed for each initiating event group are shown in Figures 19.1-15 through 19.1-39.

Response to Action Item 19-74 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-74 (AI 19-74)

Section 19.1.4.1.1.2 does not list the referenced PWR PRA in the reference section. Thus, it is unclear which specific PRAs are being considered.

Response

Information from past PWR experience is mainly based on a general experience of PRA analysts who are familiar with various PWR PRAs, including from cursory review of similar ALWR PWRs that are publically available. Since no specific PWR PRA was directly used in APR1400 PRA in Accident Sequence Analysis, the "from past PWR PRAs" clause is removed from Section 19.1.4.1.1.2. (See Attachment).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment 1 – Section 19.1.4.1.1.1 DCD Markup for Question PRA-74

[Section 19.1.4.1.1.2, page 19.1-37]

The event sequence development begins, from a plant response perspective, with all equipment available and operating normally, and then progresses to display critical and important failure paths in a logical progression. Event depictions are left to right decisions in the time order of plant response.

An event-tree-based sequence modeling approach is used with each event type based upon the initiator being developed in a unique tree. Safety functions necessary to achieve safe shutdown are modeled. Safety functions are derived ~~from past PWR PRAs and~~ from an evaluation of the plant response to the initiating event.

Event trees developed for each initiating event group are shown in Figures 19.1-15 through 19.1-39.

The results of the accident sequence analysis are the identification of the individual core damage sequences, and the analysis requirements for determining the timing and progression of each accident sequence. The timing information is required in order to evaluate the impact of the operator actions, and the time of occurrence of the automatic systems initiation signals.

Response to Action Item 19-77 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-77 (AI 19-77)

Section 19.1.4.1.1.2, it is unclear whether there are any cases where the top events are reordered to simplify the event tree.

Response

The order of system and operator functional responses are generally ordered in the event trees in sequential order based on the timing of the accident scenarios as they develop. In selected cases, events may be ordered differently to simplify the event tree structure while retaining the proper functional relationships. For example, given a small LOCA, the safety injection (SI) and auxiliary feedwater (AF) systems start nearly simultaneously; however, the success or failure of the SI system determines whether AF is used for secondary heat removal or aggressive secondary cooling. Therefore, the SIS (safety injection) top event in the Small LOCA event tree (Figure 19.1-17) is placed before the SHR (secondary heat removal) and ASC (aggressive secondary cooling) top events to simplify the event tree structure.

The accident sequence analysis is described in the Accident Sequence Analysis Notebook (APR1400-K-P-NR-013102-P).

Section 19.1.4.1.1.2 is revised as shown in Attachment.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment 1 – Section 19.1.4.1.1.2 DCD Markup for Question PRA-77

[Section 19.1.4.1.1.2, page 19.1-40]

System and operator functional responses are ordered in the event trees sequentially based on the timing of the accident scenarios as they develop. In selected cases, events may be ordered differently to simplify the event tree structure while retaining the proper functional relationships. For example, given a small LOCA, the safety injection (SI) and auxiliary feedwater (AF) systems start nearly simultaneously; however, the success or failure of the SI system determines whether AF is used for secondary heat removal or aggressive secondary cooling. Therefore, the SIS (safety injection) top event in the Small LOCA event tree (Figure 19.1-17) is placed before the SHR (secondary heat removal) and aggressive secondary cooling (ASC) top events to simplify the event tree structure.

Internal flooding, while considered to be an internal event, is described separately in Subsection 19.1.5.3.

Each Level 1 event tree sequence is assigned to an end state. The possible end states (for Level 1 analysis) are:

Response to Action Item 19-78 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-78 (AI 19-78)

Section 19.1.4.1.1.3, it is unclear whether there are any scenarios where containment failure is considered to cause core damage.

Response

For example, in the Large and Medium LOCA event trees (Figures 19.1-15 and 19.1-16, respectively), if injection is successful but containment heat removal fails, core damage is modeled. In the Level 2 analysis, the RBCM sequences (under the Containment Isolation node of the Plant Damage State Grouping Logic Diagram (Figure 19.1-41)) represent the Containment Failure Before Vessel Breach Containment Event Tree (Figure 19.1-46).

Section 19.1.4.1.1.3 is revised as shown in Attachment.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Section 19.1.4.1.1.3 DCD Markup for Question PRA-78

[Section 19.1.4.1.1.3, page 19.1-41]

Some success criteria calculations were performed using the RELAP code. Because the RELAP code has a detailed core model, these calculations used an acceptance criteria limit of 1,204.4 °C (2,200 °F) to identify the onset of core damage.

A containment failure could interfere with injection pathways to the point where the injection may be terminated. Containment failure is therefore considered to cause core damage. For example, in the Large and Medium LOCA event trees (Figures 19.1-15 and 19.1-16, respectively), if injection is successful but containment heat removal fails, core damage is modeled. In the Level 2 analysis, the RBCM sequences, under the Containment Isolation node of the Plant Damage State Grouping Logic Diagram (Figure 19.1-41) lead to the Containment Failure Before Vessel Breach Containment Event Tree (Figure 19.1-46).

c. The specification of core protection functions for core damage

Response to Action Item 19-79 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-79 (AI 19-79)

Section 19.1.4.1.1.3, it is unclear how the models incorporate existing PWR plant experience.

Response

Information from existing PWR plant experience is mainly based on a general experience of PRA analysts who are familiar with various PWR plants. Since no specific PWR plant was directly used in APR1400 PRA in Success Criteria Analysis, the sentence regarding existing PWR plant experience is removed from Section 19.1.4.1.1.3. (See Attachment).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Attachment – Section 19.1.4.1.1.3 DCD Markup for Question PRA-79

[Section 19.1.4.1.1.3, page 19.1-43]

A mission time of 24 hours is specified for each success criterion. The 24-hour mission time provides sufficient time for the initiating event to either be successfully mitigated or for the event to progress to a core damage state. If a stable plant condition cannot be achieved within 24 hours for a specific sequence, additional evaluation of that sequence is performed to determine an appropriate end state, to extend the mission time, and/or to model additional system recovery.

f. The bases for features and operating procedures

The main bases for features and operating procedures are the APR1400 emergency operating guidelines (EOGs). ~~The additional bases are very similar to those of the reference plants, which incorporate current existing PWR plant experience.~~

g. Plant thermal-hydraulic analysis for success criteria

Plant thermal-hydraulic analysis for PRA success criteria is performed. The minimum required thermal-hydraulic analysis for basic determination of success criteria and design support thermal-hydraulic analysis is conducted to specify the final success criteria.

Response to Action Item 19-80 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-80 (AI 19-80)

Section 19.1.4.1.1.3, describe the certain phenomenology that RELAP5 cannot model and how engineering judgment is applied to determine the appropriate code.

Response

Containment performance and post-core damage phenomenology cannot be modeled with the RELAP5 code; therefore MAAP was utilized for this purpose.

Section 19.1.4.1.1.3 is revised as shown in Attachment of Issue # PRA-33 (AI 19-33).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Response to Action Item 19-81 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-81 (AI 19-81)

Section 19.1.4.1.1.3, it is unclear what margin was used to account for uncertainties in the models.

Response

The margin used in the success criteria identified in Section 19.1.4.1.1.3.l. refers to the margin described in the preceding paragraphs of the same section:

1. the core damage temperature of 982.2 °C (1,800 °F) vs. 1,204.4 °C (2,200 °F) for MAAP as described in Section 19.1.4.1.1.3.b. since MAAP uses a lumped core model,

2. containment failure is assumed to lead to core damage as described in Section 19.1.4.1.1.3.b.,

3. ensuring that the success criteria results in a stable plant state at the end of the 24 hour mission time (vs. simply ensuring that core damage has not occurred at 24 hours) as described in Section 19.1.4.1.1.3.e., and

4. ensuring that the representative thermal-hydraulic analyses used to determine success criteria uses the most severe initiating event among initiating events in a group as described in Section 19.1.4.1.1.3.i.

Section 19.1.4.1.1.3.l. of the DCD is revised to reflect this (see Attachment 1).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment 1 – Section 19.1.9 DCD Markup for Question PRA-81

[Section 19.1.4.1.1.3, top of page 19.1-44]

The MAAP 4.0.8 code, the RELAP5 code, as well as analysis results described in Chapter 15 of this submittal are used to determine success criteria. It is recognized that the RELAP5 code modeling is more detailed than the MAAP code modeling. However, the MAAP code can be used to model certain phenomenology that RELAP 5 cannot. Engineering judgment is used to determine the appropriate code for the particular success criteria or scenario being examined.

k. The results of the thermal-hydraulic analysis

Representative results of the thermal-hydraulic analysis are given in Table 19.1-12 and Table 19.1-13.

l. Determination of success criteria

Final success criteria, shown in Table 19.1-8, are determined from the design, engineering judgment, and thermal-hydraulic analysis results in a manner that allows a margin for the uncertainties in the models of the thermal-hydraulic analyses and grouping of initiating events as described in paragraphs 19.1.4.1.1.3.b., 19.1.4.1.1.3.e. and 19.1.4.1.1.3.i., above.

The success criteria were determined in terms of initiating events that are modeled for the APR1400. The initiating events that are considered in full-power Level 1 PRA are:

Response to Action Item 19-82 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-82 (AI 19-82)

Section 19.1.4.1.1.3, it is unclear why the upstream and downstream of LSSB are not listed in the full power level 1 PRA initiating events list.

Response

Section 19.1.4.1.1.3 is revised to include the upstream and downstream of LSSB in the full-power Level 1 PRA initiating events list.

See Attachment.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Section 19.1.4.1.1.3 DCD Markup for Question PRA-82

[Section 19.1.4.1.1.3, pages 19.1-44 and 45]

The success criteria were determined in terms of initiating events that are modeled for the APR1400. The initiating events that are considered in full-power Level 1 PRA are:

a. Large/medium/small break LOCA

b. SGTR

c. Large secondary steam line side break (LSSB)

   1) Upstream of MSIV (LSSB-U)

   2) Downstream of MSIV (LSSB-D)

d. General transients

e. Loss of main feedwater (LOFW)

f. Feedwater line break (FWLB)

g. Loss of condenser vacuum (LOCV)

h. Loss of instrument air (LOIA)

i. Loss of 125 Vdc (LODC)

   1) Loss of Class 1E 125 Vdc A (LODCA)

   2) Loss of Class 1E 125 Vdc B (LODCB)

j. Loss of component cooling water / essential service water (LOCCW/LOESW)

   1) Partial (PLOCCW/PLOESW)

   2) Total (TLOCCW/TLOESW)

k. LOOP (i.e., grid-related, weather-related, switchyard-centered, plant-centered)

l. Interfacing systems LOCA (ISLOCA)

m. Reactor Vessel Rupture (RVR)

Response to Action Item 19-83 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-83 (AI 19-83)

Section 19.1.4.1.1.3, it is not clear why LODC is not listed as LODCA and LODCB.

Response

Section 19.1.4.1.1.3 is revised to include LODCA and LODCB in the full-power Level 1 PRA initiating events list.

See Attachment of the response to Issue # PRA-82 (AI 19-82).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Response to Action Item 19-85 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-85 (AI 19-85)

Section 19.1.4.1.1.3, it is not clear why RVR is not included in the list of initiating events.

Response

Section 19.1.4.1.1.3 is revised to include RVR in the full-power Level 1 PRA initiating events list.

See Attachment of the response to Issue # PRA-82 (AI 19-82).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Response to Action Item 19-89 Section 1.9

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 1.9

Issue # PRA-89 (AI 19-89)

DCD Chapter 1, Page 1.9-98, Item II.N states that "PRA covers seismic events, internal fire events, and internal flooding events as well as internal events. The COL applicant is to perform site-specific PRA evaluations to address any site-specific hazards." However, as discussed in DCD Chapter 19, APR1400 PRA does not include seismic events.

Response

The comment is correct in that a PRA-based SMA was performed rather than a seismic PRA.

Table 1.9-7 (4 of 5) in Section 1.9, Page 1.9-98, is clarified as shown in Attachment 1.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Table 1.9-7 (4 of 5)

Item No.	Title	Discussion
II.H	Containment Leak Rate Testing	The maximum interval between Type C leakage rate tests, which is stated in the policy, is not addressed in the APR1400 DCD Tier 2. This policy is closely related to plant operation, so the maximum Type C test interval will be considered in the course of developing plant operator's containment leak rate testing program.
II.I	Post-Accident Sampling System	Conformance is described in Subsection 9.3.2.
II.J	Level of Detail	The APR1400 has the level of detail of information required to acquire design certification.
II.K	Prototyping	Not applicable (information only)
II.L	ITAAC	Development guidance for ITAAC is addressed in Section 14.3 and ITAAC for each system is described in Tier 1 of this DCD.
II.M	Reliability Assurance Program	The APR1400 reliability assurance program, addressing the requirements appropriate for design certification is presented in the DCD Tier 2, Section 17.4.
II.N	Site-Specific Probabilistic Risk Assessments and Analysis of External Events	Addressed for the APR1400 in DCD Tier 2, Section 19.1. PRA covers ~~seismic events,~~ internal fire events, and internal flooding events as well as internal events. The COL applicant is to perform site-specific PRA evaluations to address any site-specific hazards.
II.O	Severe Accident Mitigation Design Alternatives	Addressed for the APR1400 in DCD Tier 2, Subsection 19.2.6.
II.P	Generic Rulemaking Related to Design Certification	Not applicable (information only)

Seismic events were evaluated using a PRA-based Seismic Margin Analysis (SMA) rather than a seismic PRA.

Response to Action Item 19-93 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-93 (AI 19-93)

DCD Table 19.1-137 which provides the LPSD LRF frequencies add up to about 6.6E-8, which is not consistent with the total LRF for LPSD of 1.2E-7.

Response

Section 19.1.6.2.2.3 notes that because POSs 1-4A and 13-15 estimate LRF using the at-power conditional probability of large release (CPLR), no new insights into the LPSD risk would be gained by performing importance analyses or other detailed results evaluations. Therefore, the importance analysis in Table 19.1-137 actually only includes cutsets from POSs 4B-12A. The title of Table 19.1-137 is revised to state POSs 4B-12A.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Table 19.1-137 DCD Markup for Question PRA-93

Table 19.1-137

LPSD Internal Events PRA LRF Contribution by Initiating Events – ~~All~~ POSs 4B to 12A

Initiator	Frequency	Contribution	Description
%SO	3.24E-08	48.9%	RCS Overdraining due to SCS
%SL1	1.28E-08	19.3%	Small LOCA at Reduced Inventory
%SL	5.28E-09	8.0%	Failure to Maintain Water Level at Reduced Inventory
%LPWE	3.55E-09	5.3%	Loss of offsite power of Weather-related for LPSD
%SL2	3.42E-09	5.2%	Small LOCA above Reduced Inventory
%LPSW	3.16E-09	4.8%	Loss of offsite power of Switchyard-centered for LPSD
%LPPL	2.20E-09	3.3%	Loss of offsite power of Plant-centered for LPSD
%S1	9.45E-10	1.4%	Loss of SCS (S1)
%JL	7.94E-10	1.2%	Unrecoverable LOCA
%LPGR	6.53E-10	1.0%	Loss of offsite power of Grid-related for LPSD
%KV	3.39E-10	0.5%	Loss of Class 1E 4.16kV
%ES	2.24E-10	0.3%	Loss of Essential Service Water
%TC	1.92E-10	0.3%	Total Loss of Component Cooling Water
%TS	1.92E-10	0.3%	Total Loss of Essential Service Water
%S2	1.19E-10	0.2%	Loss of SCS (S2)
%CC	6.81E-11	0.1%	Loss of Component Cooling Water

Response to Action Item 19-94 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-94 (AI 19-94)

DCD Table 19.1-148 which provides the LPSD fire LRF frequencies add up to about 1.17E-7, which is not consistent with the total LPSD fire LRF of 1.3E-7.

Response

The values in the Table 19.1-148 are not correct. The correct LRF by POS are shown in Attachment. The total LRF for these is 1.25E-7/yr, rounded up to 1.3E-7/yr.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Table 19.1-148 DCD Markup for Question PRA-94

Table 19.1-148 (1 of 2)

LPSD Fire LRF by POS

POS	LRF evaluation	CDF(/yr)*	CDF %	CPLR	LRF	% of total LRF
1	Containment Closed, at-power CPLR)	Screened in L1	-	-	-	-
2	Containment Closed, at-power CPLR)	Screened in L1	-	-	-	-
3A	Containment Closed, at-power CPLR)	6.53E-08	~~3.8~~3.7%	8.40E-02	~~5.49~~5.59E-09	4.~~75~~%
3B-JL	Containment bypass (ISLOCA)	6.83E-09	0.4%	1	6.83E-09	5.~~95~~%
3B-LX	Hatch open and no credit for closing w/o AC power	Fire SBO screened in L1	-	-	-	-
3B-other	Hatch close HEP/at-power CPLR (0.051+0.084)	~~1.75~~1.91E-07	10.~~16~~%	1.35E-01	~~2.36~~2.58E-08	20.~~27~~%
4A-JL	Containment bypass (ISLOCA)	4.17E-09	0.2%	1	4.17E-09	3.~~63~~%
4A-LX	Hatch open and no credit for closing w/o AC power	Fire SBO screened in L1	-	-	-	-
4A-other	Hatch close HEP/at-power CPLR (0.051+0.084)	1.82E-09	0.1%	1.35E-01	2.46E-10	0.2%
4B	RCS Draindown (manway open)	~~1.37~~1.40E-07	7.~~89~~%	Detailed	~~7.29~~7.81E-09	6.~~23~~%
5	Reduced Inventory Operation	~~7.65~~7.71E-07	~~44.1~~42.9%	Detailed	2.~~32E~~38E-08	19.~~91~~%
6	Fill for Refueling	~~7.37~~7.98E-08	4.~~24~~%	Detailed	~~9.06E-09~~1.05E-08	~~7.8~~8.4%
7	Refueling (Core-alteration)	-	-	-	-	-
8	Cavity drained	-	-	-	-	-
9	Refueling (Core-alteration)	-	-	-	-	-
10	RCS Draindown after Refueling	~~2.29~~2.45E-07	~~13.2~~13.6%	Detailed	~~1.70~~1.90E-08	~~14.6~~15.2%

APR1400 DCD TIER 2

Table 19.1-148 (2 of 2)

POS	LRF evaluation	CDF(/yr)*	CDF %	CPLR	LRF	% of total LRF
11	Reduced Inventory Operation	~~1.14~~1.29E-08	0.7%	Detailed	~~3.39~~5.43E-10	0.~~34~~%
12A	Refill RCS (manway open)	2.17E-07	12.~~51~~%	Detailed	~~5.19~~5.26E-09	~~4.44~~.2%
12B	Refill RCS (manway closed)	-	-	-	-	-
13	RCS Heatup/SCS Isolate at 350F	~~9.95E-09~~1.84E-08	~~0.6~~1.0%	8.40E-02	~~8.36E-10~~1.55E-09	~~0.7~~1.2%
14	RCS Heatup with SGs	Screened in L1	-	-	-	-
15	Reactor Startup	Screened in L1	-	-	-	-
All	Main Cont Rm Fires	~~2.94~~3.11E-08	1.7%	1.00E-01	~~2.94~~3.11E-09	2.5%
All	MCA Fires not evaluated in detail in L2	1.06E-08	0.6%	1	1.06E-08	~~9.1~~8.5%
Total		~~1.74~~1.80E-06	100%	-	~~1.17~~1.25E-07	100.0%

Response to Action Item 19-96 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-96 (AI 19-96)

Section 19.1.4.1.1.7, it is not clear why this section states MAAP was used to evaluate the success criteria, when the success criteria section says MAAP and RELAP were used.

Response

Both RELAP and MAAP were used. Section 19.1.4.1.1.7 states that the RELAP5 code is used to analyze the thermal-hydraulic behavior of the plant, and the MAAP code is used to evaluate the success criteria. The thermal-hydraulic analysis is used to determine the success criteria. Hence, both RELAP and MAAP were used to determine the success criteria. See the response to PRA-33 for a related issue.

Section 19.1.4.1.1.7 is revised as shown in Attachment.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Section 19.1.4.1.1.7 DCD Markup for Question PRA-96

[Section 19.1.4.1.1.7, page 19.1-59]

RELAP5

RELAP5/MOD3 (Reference 27) is used to analyze the thermal-hydraulic behavior of the plant for the success criteria, as described in Subsection 19.1.4.1.1.3.

MAAP

The modular accident analysis program (MAAP) 4.0.8 (Reference 28) is also used to evaluate the success criteria, as described in Subsection 19.1.4.1.1.3.

19.1.4.1.2 Results from Level 1 Internal Events PRA for Operations at Power

Response to Action Item 19-98 Section 9.5

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 9.5

Issue # PRA-98 (AI 19-98)

DCD Chapter 9, Pages 9.5-144 and 9.5-148 state that “The PRA for external fire events is based on the methodology in NUREG/CR-6850, as described in Chapter 19 of DCD.” However, Chapter 19 only addresses internal fires, not external fire events.

Response

External fire events are corrected to internal fire events as shown in Attachment.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Table 9.5.1-2 (20 of 70)

Paragraph	Standard Requirement	Conformance	Remarks
7.2 Fire-Safe Shutdown Analysis (FSSA) (cont.) 7.2.2 Safe Shutdown Analysis	2* A shutdown logic diagram shall be available that identifies the conditions necessary to achieve and maintain safe shutdown capability in the event of a fire and the plant features necessary to realize those conditions, including auxiliary and support features.	Conform / COL	Refer to Appendix 9.5A. internal
7.2 Fire-Safe Shutdown Analysis (FSSA) (cont.) 7.2.3 Internal Plant Examination of External Fire Events for Severe Accident Vulnerabilities.	A risk assessment that estimates the potential risk from a fire in relation to the plant's core damage frequency shall be prepared. 1* An industry-accepted examination process shall be used for the risk assessment. 2* An acceptable risk assessment shall demonstrate that the probability of core damage as a result of an internal fire is less than 1×10^{-6} per reactor year. 3 The internal plant examination of external fire events for severe accident vulnerabilities shall be used to evaluate the level of safety of the plant and shall not be used to reduce the overall plant fire protection design basis.	Conform	The PRA for ~~external~~ fire events is based on the methodology in NUREG/CR-6850, as described in Chapter 19 of DCD.
7.3 Design Basis Events and Requirements 7.3.1 Fire	1 Only one fire shall be assumed to occur at a given time, and for the purpose of a safe shutdown analysis, damage shall be assumed to occur immediately. 2* All components, including electrical cables, that are susceptible to fire damage in a single fire area (except primary containment and annulus areas) shall be assumed to be disabled or to be spuriously actuated, whichever is the worst case. 3* A fire shall not impair safe shutdown capability inside primary containment or annulus areas. 4 The plant shall be assumed to be operating at 100 percent power, with all components in their normal configuration, when a postulated fire occurs; however, the analysis also shall consider changes in plant configurations during all normal modes of operation.	Conform / COL	The FHA for the APR1400 is prepared. COLA to update the final FHA including circuits analysis.

Table 9.5.1-2 (24 of 70)

Paragraph	Standard Requirement	Conformance	Remarks
7.3 Design Basis Events and Requirements (cont.) 7.3.2* Seismic/Fire Interaction	1 A risk assessment that demonstrates the potential risk from a seismically induced fire in relationship to the plant's core damage frequency shall be prepared and used as follows: (1) The assessment shall be used to evaluate the level of safety of the plant. (2) The assessment shall not be used to reduce the overall plant fire protection design basis. 2* An industry-accepted examination process shall be used for the risk assessment.	Conform	The PRA for ~~external~~ fire events is based on the methodology in NUREG/CR-6850. internal
7.4 Separation Criteria	1 One safety division of systems that is necessary to achieve and maintain safe shutdown from either the control room or emergency control station(s) shall be maintained free of fire damage by a single fire, including an exposure fire. 2 One safety division of systems that is necessary to prevent the initiation of a design basis accident shall be maintained free of fire damage from a single fire that occurs outside the main control room. 3 Redundant cables, equipment, components, and associated circuits of nuclear safety–related or safe shutdown systems shall be located in separate fire areas, unless otherwise permitted by 7.4.3.1. 3.1 Where redundant system separation inside containment cannot be achieved, other measures shall be permitted in accordance with Section 7.6 to prevent a fire from causing the loss of function of nuclear safety–related or safe shutdown systems. 3.2 The fire barrier forming the separate fire areas specified in 7.4.3 shall have a 3-hour fire rating, and automatic area-wide detection shall be installed throughout the fire areas, unless all the following criteria are met: (1) The fire barriers forming the fire areas shall have a minimum fire-resistive rating of 1 hour.	Conform / COL	The SSA for the APR1400 is prepared in consideration of the guidance in NFPA 804 7.4.1 to 7.4.6.

Response to Action Item 19-106 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-106 (AI 19-106)

DCD Page 19.1-1169: FV should be RAW in the title for Table 19.1-142

Response

FV in the Title of Table 19.1-142 are revised as RAW as shown in Attachment 1.

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Response to Action Item 19-110 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-110 (AI 19-110)

One label on Figure 19.1-50 is SRF. The abbreviation SRF did not seem to be defined in Chapter 19.

Response

SRF is explained in Figure 19.1-50, and SRF is added to Acronym and Abbreviation List. (See Attachments 1 and 2.)

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

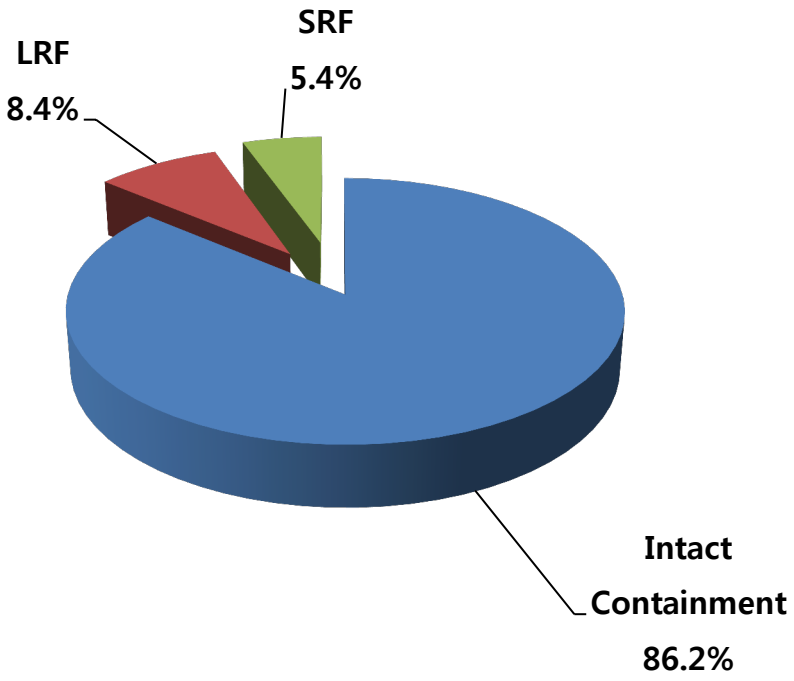
Attachment 1 – Chapter 19 DCD Markup for Question PRA-110

[Page xxviii]

SIAS	safety injection actuation signal
SIP	safety injection pump
SIS	safety injection system
SIT	safety injection tank
SL	Small LOCA
SLB	steam line break
SLOCA	small break loss of coolant accident
SMA	seismic margin analysis
SOV	solenoid operated valve
SPAR-H	standardized plant analysis risk – human reliability
SPND	self-powered neutron detector
SR	supporting requirement
SRF	small release frequency
SRM	Staff Requirements Memorandum
SRP	Standard Review Plan
SSCs	structures, systems, and components
SSE	safe-shutdown earthquake
SSIE	supporting system initiating event
STC	source term category
STP	standard temperature and pressure
SWGR	switchgear
SX	essential service water system
SY	systems analysis
T&M	test and maintenance
TB	turbine building
TBV	turbine bypass valve
TCE	two-cell equilibrium
TDAFWP	turbine-driven auxiliary feedwater pump
TDR	time domain reflectometry
TEPCO	Tokyo Electric Power Company

Attachment 2 – Section 19.1.4.2.2.2 DCD Markup for Question PRA-110

[Page 19.1-1419]



LRF – Large Release Frequency
SRF – Small Release Frequency

Figure 19.1-1 Level 2 PRA Results in Terms of Containment End State for Internal Events

Response to Action Item 19-111 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-111 (AI 19-111)

Section 19.1.4.1.1.1, describes the potential initiating events. It is unclear why there would be "potential" initiating events.

Response

See the response to Issue # PRA-63 (AI 19-63) which provides a definition of “potential initiating events” as well as a DCD markup.

Impact on DCD

There is no impact on the DCD.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Response to Action Item 19-112 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-112 (AI 19-112)

Section 19.1.4.1.1.1, error in Note 1 of Table 19.1-6, it used 'which a' instead of 'which are.'

Response

The typo is corrected in Table 19.1-6 (2 of 2). (See Attachment).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

Attachment 1 – Section 19.1.4.1.1.1 DCD Markup for Question PRA-112

[Page 19.1-287]

Table 19.1-6 (2 of 2)

Designator	Initiating Event Description	Mean Frequency (Per Rx Critical Year)(1)	Mean Frequency (Per Rx Calendar Year)(2)	Error Factor
LOOP-WE	Weather-related	3.91E-03	3.71E-03	1.7
SBO	Station Blackout	Transferred from LOOP Event Tree		1.7
LOIA(3)	Loss of Instrument Air System	2.48E-02	2.69E-02	2.1
TLOCCW(3)	Total Loss of Component Cooling Water System	2.46E-04	2.34E-04	8.4
PLOCCW(3)	Partial Loss of Component Cooling Water System	4.59E-03	4.36E-03	2.0
TLOESW(3)	Total Loss of Essential Service Water System	2.46E-04	2.34E-04	8.4
PLOESW(3)	Partial Loss of Essential Service Water System	1.72E-3	2.52E-03	2.6
RVR(4)	Reactor Vessel Rupture	3.22E-08	3.06E-08	67.5
ISLOCA(5)	Interfacing System Loss of Coolant Accident	1.24E-10	1.18E-10	10.0

(1) The mean frequencies for these initiating events are values presented in Reference 11 in units of per reactor critical year (rcry). (Excludes frequencies for ISLOCA, and reactor vessel rupture, which ~~a~~ are separately calculated.)

(2) The mean frequencies for these initiating events were adjusted to an APR1400 specific per reactor calendar year (rcy). Converting to APR1400 specific reactor calendar year (rcy), it was assumed the reactor is critical 95% of the year.
Converting to rcy, the result is:
(Mean Initiating Event Frequency/rcry) × (0.95 rcry/rcy) = Mean Initiating Event Frequency/rcy

(3) APR1400 LOCA break size from generic industry data. These LOCA initiating event frequencies are used as an estimate for APR1400 LOCA frequencies.
Support system initiating event frequencies (/rcry) for LOIA, TLOCCW, PLOCCW, TLOESW, and PLOESW are calculated using fault trees in the initiating event analysis for information purposes. However, industry values for these parameters are utilized in the quantified PRA model.

(4) Reactor Vessel Rupture frequency (2.90E-08/rcy) was taken from NUREG-1829, Volume 1, Table 7.19, for break sizes > 31 inches (Reference 52). This value was treated similarly to other LOCA frequencies, converting to per reactor critical year by multiplying by 1 rcy/0.9 rcry.

(5) The ISLOCA initiating event frequency (/rcy) is taken from calculation. No Error Factor (EF) is calculated for this initiating event frequency and thus an EF of 10 is assumed.

Response to Action Item 19-113 Section 19.1

PRA Issue List Regarding APR-1400, DCD Tier 2, SECTION 19.1

Issue # PRA-113 (AI 19-113)

Section 19.1.4.1.1.6, “Human Reliability Analysis,” Page 19.1-54, Item b states "Human-induced initiating eventsand are not considered in detail." "Eventsand" should be "events."

Response

The typo is corrected in Section 19.1.4.1.1.6. (See Attachment).

Impact on DCD

The DCD will be revised as stated in the response.

Impact on PRA

There is no impact on the PRA model.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Reports.

APR1400 DCD TIER 2

Attachment – Section 19.1.4.1.1.6 DCD Markup for Question PRA-113

[Section 19.1.4.1.1.6, page 19.1-54]

The assessment of HFEs is an important task in a comprehensive PRA. The overall approach to pre-initiator development in the HRA is consistent with the Accident Sequence Evaluation Program (ASEP) framework described in NUREG/CR-4772 (Reference 20). Pre-initiator HFEs constitute one of the four categories of HFEs:

a. Pre-Initiator Human Failure Events (Type A or Latent). These events take place prior to an initiating event, and leave a component or a system in an undesired state that does not manifest itself until an initiating event occurs. Miscalibration of instrumentation and misalignment of a manual valve on a standby system are examples of Type A HFEs.

b. Human-Induced Initiating Events. These events are human actions that contribute to the occurrence of an initiating event. Human-induced initiating events are implicitly included in the initiating events and are not considered in detail.

c. Initiating Event-Related HFEs (Type B). A failure to perform a Type B action results in the occurrence of an initiating event.

d. Post-Initiator HFEs (Type C or Dynamic). These events describe the response of operating staff to an initiating event or other plant upset event.

The pre-initiator HRA for the APR1400 PRA models the Type A, or latent, HFEs.