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D. NEI 04-02 Non-Power Operational Modes Transition

13 Pages Attached

NFPA 805 Section 1.3.1 - Nuclear Safety Goal

The nuclear safety goal is to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition.

Implementing Guidance: NEI 04-02, Table F-1, Part 1

Review existing Outage Management Processes.

Define Higher Risk Evolutions (HREs), if not already defined in plant outage management procedures. The HRE definition should consider the following:

- Time to boil
- Reactor coolant system and fuel pool inventory
- Decay heat removal capability

Review:

VCSNS Station Scheduling Procedure SSP-004, “Outage Safety Review Guidelines”, provides the basic definition for “High Risk Evolutions” used during plant outages, which is: "Outage activities, plant configurations or conditions during shutdown where the plant is more susceptible to an event causing the loss of a Key Safety Function”. Implementation of this definition, and the actual determination of higher risk evolutions, is based on an evaluation of outage configurations that are compared to equipment availability criteria. These criteria, which are based on technical specifications and outage safety principles for establishment of defense-in-depth are identified in a table in SSP-004, and tracked in a “Safety System Bar Chart” to ensure that adequate “defense in depth” is maintained throughout the course of the outage.

SSP-004 will be revised to establish HREs using a graded approach, based on three primary criteria:

1) Time to Boil 2) Inventory 3) Equipment Availability (availability and reliability of decay heat removal systems).

Using these criteria and the score that results from the process, a risk level is assigned. SSP-004 requires that contingency plans are developed for any evolutions that are graded as high risk to maximize defense-in-depth.

Unit Applicability: 1

Reference Document:

VCSNS Station Scheduling Procedure SSP-004, “Outage Safety Review Guidelines”

NFPA 805 Section 1.3.1 - Nuclear Safety Goal

The nuclear safety goal is to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition.

Implementing Guidance: NEI 04-02, Table F-1, Part 2

Identify Components and Cables:

The identification of systems and components to be included in the NPO Review begins with the identification of the plant operational states (POS) that need to be considered.

Identify the various operational states that a plant goes through during NPO, and which of those the most risk significant.

Review:

A review of the VCSNS Station Scheduling Procedure SSP-004, "Outage Safety Review Guidelines", along with discussions with VCSNS Operations, PRA and Outage management personnel resulted in the identification of the Plant Operational States that were included in VCSNS Non-Power Operational (NPO) Modes Review. These Plant Operational States are described in Attachment D-1.

VCSNS Station Scheduling Procedure SSP-004 provided the basis for establishing the Key Safety Functions that were evaluated during the VCSNS NPO review. Attachment D-2 provides a listing of the KSF that were identified from SSP-004 and included in the NPO review. This attachment also identifies the independent success paths that are available to ensure that the KSF can be met.

The equipment required to maintain the NPO KSF and success paths identified in Attachment D-2 was determined to be largely a sub-set of the equipment required to safely shutdown the plant as a result of a fire while at power. Included in this equipment identification process was the development of logic diagrams that correlate with the success paths identified in Attachment D-2. In some cases, the success paths and associated equipment support more than one KSF. The success path logics identified active components required to support the KSF. The results of this KSF equipment identification was loaded into the PC-CKS equipment and cable database; and the success path logics were used to develop CAFTA fault trees in the VCSNS Fire Safe Shutdown compliance assessment program (ARC).

Approximately 15 components were identified as being needed to support a NPO KSF that was not included on the at-power Nuclear Safety Assessment (NSA) safe shutdown equipment list. 11 of these were active components that required additional circuit analysis. These additional circuit analyses were performed using VCSNS NFPA 805 Transition Project Instruction 4.4, "Cable Selection and Circuit Analysis". This procedure utilizes the methodology provided in NEI 00-01, "Guidance for Post-Fire Safe Shutdown Analysis".

NFPA 805 Section 1.3.1 - Nuclear Safety Goal

Review (continued):

The results of the completed circuit analysis for each of these components was loaded into PC-CKS and documented in the same manner as the at-power safe shutdown components. Information documented in this circuit analysis included the identification of required position or condition of component, cables, function and failure mode of the cable, and any associated circuits. The additional circuit analyses that were performed for the components identified above included the identification and routing of associated cables on a fire zone and area basis.

The ARC program, which contains all of the information required to perform a fire area assessment (component and cable information is imported from the PC-CKS database) was utilized to produce reports (Compliance Assessment Reports) that allowed for evaluations on a fire area basis. These reports identify NPO components, and their cables, assigned to each KSF success path to determine which paths might be potentially impacted as a result of fire induced damage to cables and/or equipment. Assessments were then made to determine which KSF path may be impacted by a fire in a given area. If it was determined that all paths that are capable of supporting a KSF could be lost in that fire area, a "pinch point" was identified. A "pinch point" is defined as a plant location (fire area) where all of the NPO success paths that are credited to perform a specific KSF could potentially be rendered unavailable by a single fire.

Unit Applicability: 1

Reference Documents:

SCANA NFPA-805 Transition Project Instruction 4.4, "Cable Selection and Circuit Analysis"

VCSNS Technical Report TR07800-008, "NFPA 805 Non-Power Operational Modes Transition Review"

NFPA 805 Section 1.3.1 - Nuclear Safety Goal

The nuclear safety goal is to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition.

Implementing Guidance: NEI 04-02, Table F-1, Part 3

Perform Fire Area Assessments (Identify pinch points).

Identify locations where:

1. Fires may cause damage to the equipment (and cabling) credited above, or
2. KSFs are achieved solely by crediting recovery actions, e.g., alignment of gravity feed.

Fire modeling may be used to determine if postulated fires in a fire area are expected to damage equipment (and cabling) thereby eliminating a pinch point.

Review:

VCSNS performed reviews of each fire area where equipment or cabling associated with KSF success paths might be damaged as a result of a fire. These reviews identified that there are fire areas where a single fire could result in a loss of all credited paths for a given KSF (i.e. pinch point). The review also identified that there are certain fire areas that are vulnerable to a loss of a KSF if certain system trains or components are taken out of service during a non-power operational mode and a fire were to occur. The pinch points that were identified were resolved through a combination of procedural changes, crediting modifications that are to be implemented as a result of the re-validated post-fire safe shutdown analysis, or use of recovery actions. Fire Areas where a fire might cause damage to equipment required to support a KSF path are identified in VCSNS Technical Report TR07800-008, "NFPA 805 Non-Power Operational Modes Transition Review".

The assessments that were performed as part of the NPO review conservatively assumed that all NPO components or component cables in the fire area may be lost due to a fire. Utilizing the review methodology outlined in this Table and the approaches that were developed to alleviate the identified "pinch points" precluded the need to utilize fire modeling in order to resolve a KSF concern.

Unit Applicability: 1

Reference Document:

VCSNS Technical Report TR07800-008, "NFPA 805 Non-Power Operational Modes Transition Review"

NFPA 805 Section 1.3.1 - Nuclear Safety Goal

The nuclear safety goal is to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition.

Implementing Guidance: NEI 04-02, Table F-1, Part 14

Manage risks associated with fire-induced vulnerabilities during the outage.

During those NPO evolutions where risk is relatively low:

The normal fire protection program defense-in-depth actions are credited for addressing the risk impact of those fires that potentially impact one or more trains of equipment that provide a KSF required during non-power operations, but would not be expected to result in a nuclear safety objective not being met. The following actions are considered to be adequate to address minor losses of system capability or redundancy:

- Control of Ignition Sources
  - Hot Work (cutting, welding and/or grinding)
  - Temporary Electrical Installations
  - Electric portable space heaters
- Control of Combustibles
  - Transient fire hazards
  - Modifications
  - Flammable and Combustible liquids and gases
- Compensatory Actions for fire protection system impairments
  - Openings in fire barriers
  - Inoperable fire detectors or detection systems
  - Inoperable fire suppression systems
  - Housekeeping

During those NPO evolutions that are defined as HREs:

Additional fire protection defense in depth measures will be taken during HREs by:

- Managing risk in fire areas that contain known pinch points.
- Managing risk in fire areas where pinch points may arise because of equipment taken out of service

NUMARC 91-06 discusses the development of outage plans and schedules. A key element of that process is to ensure the KSFs perform as needed during the various outage evolutions. During outage planning, the NPO Fire Area Assessment will be reviewed to identify areas of single-point KSF vulnerability during higher risk evolutions to develop any needed contingency plans/actions. For those areas, combinations of the following options will be considered to reduce fire risk depending upon the significance of the potential damage.

- Prohibition or limitation of hot work in fire areas during periods of increased vulnerability.
- Verification of operable detection and /or suppression in the vulnerable areas.

NFPA 805 Section 1.3.1 - Nuclear Safety Goal

Implementing Guidance: NEI 04-02, Table F-1, Part 4 (continued)

- Plant configuration changes (removing power from equipment once it is placed in its desired position).
- Provision of additional fire patrols at periodic intervals or other appropriate compensatory measures (such as surveillance cameras) during increased vulnerability.
- Use of recovery actions to mitigate potential losses of Key Safety Functions.
- Identification and monitoring in-situ ignition sources for "fire precursors" (e.g., equipment temperatures).
- Reschedule work to a period with lower risk or higher DID.

In addition, for KSF Equipment removed from service during the HREs the impact will be evaluated based on KSF equipment status and the NPO Fire Area Assessment to develop needed contingency plans/actions.

Review:

Approximately 50 pinch points were identified during the performance of the NPO fire area reviews, involving 41 individual components. In order to preclude or mitigate these KSF failures, a number of strategies were developed. These strategies included revisions to plant shutdown and abnormal operating procedures. These planned procedural revisions make changes to plant equipment as the plant is brought to cold shutdown conditions, and were made to preserve the KSF. Plant operating procedures will also be revised to include recovery actions for those instances where operator actions would be necessary to ensure that a specific KSF can be maintained. The pinch points that were identified are documented in VCSNS Technical Report TR07800-008, "NFPA 805 Non-Power Operational Modes Transition Review".

To address concerns associated with equipment being taken out of service during NPO modes, and the potential for a concurrent fire, the VCSNS Station Scheduling Procedure (SSP-004) will be revised to provide instructions that will assist in mitigating the effects of a fire if one were to occur. This procedure revision will provide guidelines for actions to be taken in specific fire areas when components or system trains are taken out of service. For those fire areas where the credited KSF system or equipment has been taken out of service the following guidelines have been included in the outage management procedure:

- Prohibition or limitation of hot work.
- Prohibition or limitation of combustible materials, and/or
- Establishment of additional fire watches as appropriate.

Utilizing the above outlined approaches to alleviate the identified "pinch points" precluded the need to utilize fire modeling in order to resolve a KSF concern.

NFPA 805 Section 1.3.1 - Nuclear Safety Goal (continued)

Implementing Guidance: NEI 04-02, Table F-1, Part 4 (continued)

Unit Applicability: 1

Reference Documents:

VCSNS Technical Report TR07800-008, R0, "NFPA 805 Non-Power Operational Modes Transition Review"

VCSNS Station Scheduling Procedure SSP-004, “Outage Safety Review Guidelines”

Attachment D-1
Plant Operational States

Based on discussions in an Outage Stakeholder expert panel review, it was agreed that the NPO Review for the VCSNS would include all plant operational states (POS) that cannot be evaluated using the at-power compliance assessment model, with emphasis placed on fires that may occur during higher risk evolutions. The at-power compliance assessment model was used to evaluate fires occurring during Mode 3 and Mode 4 prior to RHR initiation. The "higher risk evolution" to be reviewed would be when the POS meets the following conditions, thus constituting a higher risk condition:

- Fuel is in the reactor vessel, AND
- Thermal margin is low with time to core boil ≤40 minutes, OR
- The plant is in a reduced inventory condition (i.e. water level ≤ 36 inches below the reactor vessel flange).

The NPO evaluation then would consider the plant system alignments using the success paths required to be in service by VCSNS Station Scheduling Procedure SSP-004, "Outage Safety Review Guidelines" for high risk evolutions.

It should be noted that the time to boil limitation provided in SSP-004 is the reference point from which actions need to be taken, and is conservative and provides additional margin for risk since it does not include the time to reach core uncover following the onset of boiling. Maintaining the core covered with water is the ultimate goal of preventing fuel damage and preserving the nuclear safety performance criteria.

FAQ 07-0040, *Non-Power Operations Clarification*, Revision 4, Table F-2 (NRC Accession # ML082070249) has identified those plant operating states with respect to NFPA 805 for pressurized water reactors that need to be considered and evaluated as part of the NPO review process. The guidance contained in this attachment has been used to supplement that contained in NEI-04-02.

1. **POS 1**: This POS considers the Reactor Coolant System (RCS) as being closed and pressurized; the pressurizer may or may not have a bubble, and the secondary side of the steam generators as being filled. It begins when the RHR system is placed in the shutdown cooling mode of operation, and ends when the RCS is vented. This will include Mode 4 (Hot Shutdown) and portions of Mode 5 (Cold Shutdown). For the purposes of the NPO review effort this POS has been identified with two variations (configurations POS 1A and POS 1B): one with steam generators available for heat removal, and the other where the steam generators are no longer available.

Attachment D-1(continued)

1A. In the configuration where steam generators are available, FAQ 07-0040 has proposed that no additional reviews would be required for this plant operational state under NEI 04-02. This disposition is based upon previously performed risk reviews cited in FAQ 07-0040. The conclusion of these studies is that most outage configurations (or POS) are of relatively low risk and there are only a few configurations or POS that present a risk near or greater than at-power operations. This is because the availability of steam generators along with the Residual Heat Removal System provides sufficient redundancy and diversity to remove core decay heat such that risk to core damage is significantly low and does not warrant further evaluation as part of this NPO review. As with Mode 3, the plant configuration and available equipment for this POS is similar to the conditions evaluated in the at-power model and therefore do not require further evaluation using the NPO assessment model.

1B. The second variation of POS 1 is the case where the steam generators are no longer capable of being used to remove core decay heat. For the VCSNS evaluation this POS considered that the RCS has been cooled to the point where the steam generators are no longer capable of steaming and removing decay heat, and the RHR system is the sole means of maintaining the RCS temperature. At this point the RCS has not yet been vented, and may be in the process of being brought to solid plant conditions to remove steam and non-condensable gases from the Pressurizer. Once this short duration solid plant operation is completed, the RCS will be vented, and the plant will be in POS 2. This POS configuration is evaluated using the NPO assessment model.

2. **POS 2**: This POS begins when the RCS has been vented such that the steam generators cannot sustain core heat removal, and an adequate vent path exists to preclude the RCS from re-pressurizing to a point where the RHR system would need to be isolated and made unavailable. This operational state will include portions of Mode 5 (Cold Shutdown) and Mode 6 (Refueling). This POS includes reduced inventory operations and midloop operations with a vented RCS, and is evaluated using the NPO assessment model.

3. **POS 3**: This POS represents the shutdown condition when the refueling cavity water level is at or above the minimum level required for movement of irradiated fuel assemblies with containment as defined by VCSNS Technical Specifications. This POS occurs during Mode 6, and has been considered in the VCSNS NPO Review.

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E. NEI 04-02 Radioactive Release Transition

17 Pages Attached

Radioactive Release Analysis

Compartmentation

The first step of the review was to develop a comprehensive list of areas within the VCSNS owner-controlled area which contain radiological hazards. Existing pre-fire plans were reviewed to determine which areas contain radiological hazards. For areas not included in existing pre-fire plans, VCSNS radiological protection personnel were contacted to determine if there are additional areas within the owner-controlled area which may contain radiological hazards. These areas could include remote outlying buildings, hot tool shops, rooms containing radiological samples, and temporary staging areas during outages. The operational mode of the plant at power and at nonpower (outage) was considered in the development of areas containing radiological hazards.

Training and Procedure Review

In accordance with NEI 04-02, Appendix G, fire brigade training material, fire protection procedures, and radiation protection procedures were reviewed to determine if instructions and strategies are present to prevent or minimize uncontrolled radiological release during firefighting activities.

Pre-Fire Plan Review

Pre-fire plans were reviewed to determine which features are in place to prevent or minimize an uncontrolled radiological release due to a fire event or firefighting activities. Specifically, this review included a description of the radiological hazards, the drainage and water containment features present, HVAC systems present, and the potential for cross-contamination of radiologically clean areas due to fire fighting activities and fire suppression agents such as water, foam and portable fire extinguishers (CO_2, dry chemical, etc.).

Engineered Controls Review

Drainage information was derived from drainage design basis documentation. The location of floor drains were reviewed to determine if drain paths lead to proper filtering and monitoring of liquid radioactive waste before release, consistent with regulatory limits. HVAC and radiation monitoring design basis documentation was reviewed to determine which areas featured HVAC systems designed to contain and process airborne contamination. Pre-fire plan and station fire protection plan drawings were reviewed to determine which areas have the potential for cross-contamination of a radiological boundary due to firefighting activities.

The results of the radioactive review are documented in Table E-1 below. See Attachment S, Table S-2, for implementation items.

NEI 04-02 Table E-1 Radioactive Release Transition Engineered Controls Review

Pre-Fire Plan Title	Building / Elevation	Fire Zones	Date	RCA	Screened In	Engineering Controls		Training Review Results	Open Items	Conclusions
						Liquid	Airborne			
AAP – Auxiliary Access Portal	AP-1st Floor AP-2nd Floor	N/A	10/31/02	N	N	N/A	N/A	N/A	N/A	Not required
AB – Auxiliary Building 374/385	AB-374	AB-1.1, AB-1.2, AB-1.3	08/01/05	Y	Y	Aux. Building floor drains route to Liquid Waste System for monitoring and release	Aux. Building Charcoal Exhaust system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
	AB-385	AB-1.1	08/01/05	Y	Y	Aux. Building floor drains route to Liquid Waste System for monitoring and release	Aux. Building Charcoal Exhaust system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
AB – Auxiliary Building 388/397	AB-388	AB-1.4, AB-1.5, AB-1.6, AB-1.7	08/01/05	Y	Y	Aux. Building floor drains route to Liquid Waste System for monitoring and release	Aux. Building Charcoal Exhaust system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials

NEI 04-02 Table E-1 Radioactive Release Transition Engineered Controls Review

Pre-Fire Plan Title	Building / Elevation	Fire Zones	Date	RCA	Screened In	Engineering Controls		Training Review Results	Open Items	Conclusions
						Liquid	Airborne			
	AB-397	AB-1.8	08/01/05	Y	Y	Aux. Building floor drains route to Liquid Waste System for monitoring and release	Aux. Building Charcoal Exhaust system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
AB – Auxiliary Building 400	AB-400	AB-1.4, AB-1.9	08/01/05	Y	Y	Aux. Building floor drains route to Liquid Waste System for monitoring and release	Aux. Building Charcoal Exhaust system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
AB – Auxiliary Building 412 & West Pen Access Area	AB-412, WPAA-412	AB-1.10, AB-1.17, IB-25.4, YD-1	08/01/05	Y	Y	Aux. Building floor drains route to Liquid Waste System for monitoring and release	Aux. Building Charcoal Exhaust system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
AB – Auxiliary Building 426	AB-426	AB-1.10	08/01/05	Y	Y	Aux. Building floor drains route to Liquid Waste System for monitoring and release	Aux. Building Charcoal Exhaust system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials

NEI 04-02 Table E-1 Radioactive Release Transition Engineered Controls Review

Pre-Fire Plan Title	Building / Elevation	Fire Zones	Date	RCA	Screened In	Engineering Controls Liquid	Engineering Controls Airborne	Training Review Results	Open Items	Conclusions
AB – Auxiliary Building 436 & Hot Machine Shop	AB-436	AB-1.18, AB-1.19, IB-25.8, YD-1	08/01/05	Y	Y	Aux. Building floor drains route to Liquid Waste System for monitoring and release	Aux. Building Charcoal Exhaust system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
	Hot Machine Shop - 436	AB-1	08/01/05	Y	Y	Aux. Building floor drains route to Liquid Waste System for monitoring and release	Aux. Building Charcoal Exhaust system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
AB – Auxiliary Building 446/447/452	AB-446, AB-447	AB-1.18	08/01/05	Y	Y	Aux. Building floor drains route to Liquid Waste System for monitoring and release	Aux. Building Charcoal Exhaust system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
	AB-452	AB-1.21	08/01/05	Y	Y	Aux. Building floor drains route to Liquid Waste System for monitoring and release	Aux. Building Charcoal Exhaust system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials

NEI 04-02 Table E-1 Radioactive Release Transition Engineered Controls Review

Pre-Fire Plan Title	Building / Elevation	Fire Zones	Date	RCA	Screened In	Engineering Controls		Training Review Results	Open Items	Conclusions
						Liquid	Airborne			
AB – Auxiliary Building 463	AB-463	AB-1.21,AB-1.22, AB-1.23, AB-1.24, AB-1.25, AB-1.26, AB-1.27, AB-1.28, AB-1.29-1, IB-25.9	09/14/09	Y	Y	Aux. Building floor drains route to Liquid Waste System for monitoring and release	Aux. Building Charcoal Exhaust system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
AB – Auxiliary Building 485/511	AB-485, AB-511	AB-1.28, AB-1.30, AB-1.31	08/01/05	Y	Y	Aux. Building floor drains route to Liquid Waste System for monitoring and release	Aux. Building Charcoal Exhaust system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
ASB – Auxiliary Service Building 436	ASB-436	N/A	12/12/05	N	N	N/A	N/A	N/A	N/A	Not required
ASB – Auxiliary Service Building 443	ASB-443	N/A	12/12/05	N	N	N/A	N/A	N/A	N/A	Not required
CAB – 436 Containment Access Building Cold Side	CAB-436 "COLD"	N/A	03/11/02	N	Y (Cross-contamination)	None	None	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials

NEI 04-02 Table E-1 Radioactive Release Transition Engineered Controls Review

Pre-Fire Plan Title	Building / Elevation	Fire Zones	Date	RCA	Screened In	Engineering Controls: Liquid	Engineering Controls: Airborne	Training Review Results	Open Items	Conclusions
CAB – 436 Containment Access Building Hot Side	CAB-436 "HOT"	N/A	03/11/02	Y	Y	None	None	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
CB – Control Building 400/412	CB-400	CB-2, CB-5	08/01/05	Y	Y	None	The Controlled Access Area exhaust system controls the release of radioactive materials in gaseous effluents	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
	CB-412	CB-1.1, CB-2, CB-3.1, CB-5	08/01/05	Y	Y	None	The Controlled Access Area exhaust system controls the release of radioactive materials in gaseous effluents	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
CB – Control Building 425	CB-425	CB-1.1, CB-1.2, CB-4	05/11/09	Y	Y	None	The Controlled Access Area exhaust system controls the release of radioactive materials in gaseous effluents	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials

NEI 04-02 Table E-1 Radioactive Release Transition Engineered Controls Review										
Pre-Fire Plan Title	Building / Elevation	Fire Zones	Date	RCA	Screened In	Engineering Controls		Training Review Results	Open Items	Conclusions
						Liquid	Airborne			
CB – Control Building 436	CB-436	CB-6, CB-7, CB-8.1, CB-8.2, CB-8.3, CB-9, CB-10, CB-12, CB-14	08/01/05	N	N	N/A	N/A	N/A	N/A	Not required
CB – Control Building 448	CB-448	CB-8.4, CB-8.5, CB-15	03/30/06	N	N	N/A	N/A	N/A	N/A	Not required
CB – Control Building 463	CB-463	CB-8.5 CB-17.1, CB-17.2, CB-17.3, CB-18, CB-20, CB-21	03/30/06	N	N	N/A	N/A	N/A	N/A	Not required
CB – Control Building 482	CB-482	CB-22, CB-23	08/01/05	Y	Y	None	The Controlled Access Area exhaust system controls the release of radioactive materials in gaseous effluents	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
CB – Control Building 505	CB-505	CB-24	08/01/05	N	N	N/A	N/A	N/A	N/A	Not required

NEI 04-02 Table E-1 Radioactive Release Transition Engineered Controls Review										
Pre-Fire Plan Title	Building / Elevation	Fire Zones	Date	RCA	Screened In	Engineering Controls		Training Review Results	Open Items	Conclusions
						Liquid	Airborne			
CSW – Contaminated Storage (Hot) Warehouse	CSW	N/A	12/04/96	Y	Y	None	None	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision training materials
CT – Cooling Tower	CT	N/A	07/24/02	N	N	N/A	N/A	N/A	N/A	Not required
CTC – Craft Training Center	CTC	N/A	07/24/02	N	N	N/A	N/A	N/A	N/A	Not required
CWPH – Circulating Water Pump House 436	CWPH-436	CWPH-1, CWPH-2	11/05/02	N	N	N/A	N/A	N/A	N/A	Not required
DG – Diesel Generator Building 400/427	DG-400, DG-427	DG-1.1, DG-2.1	05/22/08	N	N	N/A	N/A	N/A	N/A	Not required
DG – Diesel Generator Building 436/447	DG-436, DG-447	DG-1.2, DG-2.2	05/22/08	N	N	N/A	N/A	N/A	N/A	Not required
DG – Diesel Generator Building 463	DG-463	DG-1.2, DG-2.2	05/22/08	N	N	N/A	N/A	N/A	N/A	Not required
DWP – Demin Water Pumphouse 436	DWP-436	N/A	11/22/96	N	N	N/A	N/A	N/A	N/A	Not required

NEI 04-02 Table E-1 Radioactive Release Transition Engineered Controls Review

Pre-Fire Plan Title	Building / Elevation	Fire Zones	Date	RCA	Screened In	Engineering Controls		Training Review Results	Open Items	Conclusions
						Liquid	Airborne			
EFC – Employee Fitness Center (Old QA Bldg.)	QA-436	N/A	12/17/96	N	N	N/A	N/A	N/A	N/A	Not required
FHB – Fuel Handling Building 412/412-9/424	FHB-412	FH-1.1	08/01/05	Y	Y	FHB floor drains route to Liquid Waste System for monitoring and release	FHB Exhaust System is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
	FHB-412'-9", FHB-424	FH-1.2, FH-1.3	08/01/05	Y	Y	FHB floor drains route to Liquid Waste System for monitoring and release	FHB Exhaust System is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
FHB – Fuel Handling Building 436/443/444/446	FHB-436, FHB-443, FHB-444, FHB-446	FH-1.3, FH-1.4	08/01/05	Y	Y	FHB floor drains route to Liquid Waste System for monitoring and release	FHB Exhaust System is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials

NEI 04-02 Table E-1 Radioactive Release Transition Engineered Controls Review

Pre-Fire Plan Title	Building / Elevation	Fire Zones	Date	RCA	Screened In	Engineering Controls: Liquid	Engineering Controls: Airborne	Training Review Results	Open Items	Conclusions
FHB – Fuel Handling Building 463	FHB-463	FH-1.4	08/01/05	Y	Y	FHB floor drains route to Liquid Waste System for monitoring and release	FHB Exhaust System is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
IB – Intermediate Building 412/ 423-6/EPAA-412/423/426	IB-412, IB-423'-6 Slab, EPAA-412	IB-1, IB-2, IB-3, IB-4, IB-5, IB-6, IB-7.1, IB-7.2, IB-7.3, IB-8, IB-9, IB-23.1, IB-25.1, IB-25.2, IB-25.3	08/04/08	Y	Y	This area of the Intermediate Building utilizes the Aux. Building floor drain system which routes to Liquid Waste System for monitoring and release	This area of the Intermediate Building utilizes the Aux. Building Charcoal Exhaust system which is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
	IB-423	IB-10, IB-22.1	08/01/05	N	N	N/A	N/A	N/A	N/A	Not required
	IB-426	IB-11, IB-23.2	08/01/05	N	N	N/A	N/A	N/A	N/A	Not required

NEI 04-02 Table E-1 Radioactive Release Transition Engineered Controls Review

Pre-Fire Plan Title	Building / Elevation	Fire Zones	Date	RCA	Screened In	Engineering Controls		Training Review Results	Open Items	Conclusions
						Liquid	Airborne			
IB – Intermediate Building 436/ 436 EPAA/451	IB-436, EPAA-436, IB-451	IB-12, IB-13, IB-14, IB-15, IB-16, IB-17, IB-18, IB-19, IB-22.2, IB-23.3, IB-24, IB-25.5, IB-25.6, IB-25.7, IB-26	08/01/05	N	N	N/A	N/A	N/A	N/A	Not required
IB – Intermediate Building 463/476	IB-463, IB-476	IB-20, IB-21.1, IB-21.2	08/01/05	N	N	N/A	N/A	N/A	N/A	Not required
Large Area Fire	N/A	N/A	06/05/08	Y	Y	None	None	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of training materials
MMS – Mechanical Maintenance Building 436	MMS-436	N/A	07/24/02	N	N	N/A	N/A	N/A	N/A	Not required

NEI 04-02 Table E-1 Radioactive Release Transition Engineered Controls Review

Pre-Fire Plan Title	Building / Elevation	Fire Zones	Date	RCA	Screened In	Engineering Controls: Liquid	Engineering Controls: Airborne	Training Review Results	Open Items	Conclusions
NDE – NDE Radiography Lab 436	NDE-436	N/A	06/20/00	Y	Y	None	None	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
NOB – Nuclear Operations Building 1st Floor	NOB-1st Floor	N/A	07/24/02	N	N	N/A	N/A	N/A	N/A	Not required
NOB – Nuclear Operations Building 2nd Floor	NOB-2nd Floor	N/A	07/24/02	N	N	N/A	N/A	N/A	N/A	Not required
NTC – Nuclear Training Center Basement	NTC-Basement	N/A	12/17/96	N	N	N/A	N/A	N/A	N/A	Not required
NTC-First Floor Nuclear Training Center	NTC-1st Floor	N/A	12/17/96	N	N	N/A	N/A	N/A	N/A	Not required
RB – Reactor Building 412	RB-412	RB-1	01/16/97	Y	Y	Reactor Building floor drains route to Liquid Waste System for monitoring and release	Reactor Building ventilation system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of training materials

NEI 04-02 Table E-1 Radioactive Release Transition Engineered Controls Review

Pre-Fire Plan Title	Building / Elevation	Fire Zones	Date	RCA	Screened In	Engineering Controls: Liquid	Engineering Controls: Airborne	Training Review Results	Open Items	Conclusions
RB – Reactor Building 436	RB-436	RB-1	12/17/96	Y	Y	Reactor Building floor drains route to Liquid Waste System for monitoring and release	Reactor Building ventilation system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of training materials
RB – Reactor Building 463	RB-463	RB-1	01/16/97	Y	Y	Reactor Building floor drains route to Liquid Waste System for monitoring and release	Reactor Building ventilation system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of training materials
RB – Reactor Building 515/552	RB-515, RB-552	RB-1	12/10/96	Y	Y	Reactor Building floor drains route to Liquid Waste System for monitoring and release	Reactor Building ventilation system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of training materials
RMB – Radiological Maintenance Building 436 Cold Side	RMB-436 COLD	N/A	07/24/02	N	N	N/A	N/A	N/A	N/A	Not required

NEI 04-02 Table E-1 Radioactive Release Transition Engineered Controls Review

Pre-Fire Plan Title	Building / Elevation	Fire Zones	Date	RCA	Screened In	Engineering Controls: Liquid	Engineering Controls: Airborne	Training Review Results	Open Items	Conclusions
RMB – Radiological Maintenance Building 436 Hot Side	RMB-436 HOT	N/A	07/24/02	Y	Y	RMB floor drains route to Hot Machine Shop and Decontamination Pit for monitoring and release	RMB ventilation system is designed to process airborne contamination for monitoring and release	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
SB – Service Building 436	SB-436	N/A	03/08/00	N	N	N/A	N/A	N/A	N/A	Not required
SB – Service Building 448	SB-448	N/A	03/08/00	N	N	N/A	N/A	N/A	N/A	Not required
SWPH – Service Water Pump House 425	SWPH-425	SWPH-1, SWPH-2, SWPH-5.1, SWPH-5.2, SWPH-5.3	08/01/05	N	N	N/A	N/A	N/A	N/A	Not required
SWPH – Service Water Pump House 436/441	SWPH-436	SWPH-5.1, SWPH-5.2, SWPH-5.3	08/01/05	N	N	N/A	N/A	N/A	N/A	Not required
	SWPH-441	SWPH-3, SWPH-4.1, SWPH-4.2	08/01/05	N	N	N/A	N/A	N/A	N/A	Not required
TB – Turbine Building 412	TB-412	TB-1	04/08/09	N	N	N/A	N/A	N/A	N/A	Not required
TB – Turbine Building 436	TB-436	TB-1	04/08/09	N	N	N/A	N/A	N/A	N/A	Not required
TB – Turbine Building 463	TB-463	TB-1	04/08/09	N	N	N/A	N/A	N/A	N/A	Not required

NEI 04-02 Table E-1 Radioactive Release Transition Engineered Controls Review

Pre-Fire Plan Title	Building / Elevation	Fire Zones	Date	RCA	Screened In	Engineering Controls		Training Review Results	Open Items	Conclusions
						Liquid	Airborne			
WHS A – Warehouse A	WHS A	N/A	07/10/02	Y	Y	None	None	Training materials require update regarding fires in RCA and strategies to minimize uncontrolled radiological release	1-3	The performance requirements of NFPA 805 for radiological release will be satisfied with the revision of pre-fire plans and training materials
WHS B – Warehouse B	WHS B	N/A	07/10/02	N	N	N/A	N/A	N/A	N/A	Not required
WHS C – Warehouse C 1st Floor	WHS C – 1st Floor	N/A	07/29/02	N	N	N/A	N/A	N/A	N/A	Not required
WHS C – Warehouse C 2nd Floor	WHS C – 2nd Floor	N/A	11/11/96	N	N	N/A	N/A	N/A	N/A	Not required
WHS – Warehouse D	WHS D	N/A	11/12/96	N	N	N/A	N/A	N/A	N/A	Not required
WHS – Warehouse E	WHS E	N/A	03/24/10	N	N	N/A	N/A	N/A	N/A	Not required
WT – Filter Water Pump House	FWP-436	N/A	03/24/10	N	N	N/A	N/A	N/A	N/A	Not required
WT – Potable Water Supply Building	PWS-436	N/A	03/24/10	N	N	N/A	N/A	N/A	N/A	Not required
WT – Water Treatment 436	WT-436	N/A	03/24/10	N	N	N/A	N/A	N/A	N/A	Not required
WT – Water Treatment 463	WT-463	N/A	10/31/02	N	N	N/A	N/A	N/A	N/A	Not required

NEI 04-02 Table E-1 Radioactive Release Transition Engineered Controls Review

Pre-Fire Plan Title	Building / Elevation	Fire Zones	Date	RCA	Screened In	Engineering Controls		Training Review Results	Open Items	Conclusions
						Liquid	Airborne			
Yard – Auxiliary Boiler Building 436	Aux. Boiler House	N/A	12/09/96	N	N	N/A	N/A	N/A	N/A	Not required
Yard – Switchyard & Relay House	Switchyard Area	N/A	02/08/07	N	N	N/A	N/A	N/A	N/A	Not required
Yard – Transformer Area	Transf. Area	N/A	05/07/09	N	N	N/A	N/A	N/A	N/A	Not required
Yard ABF- 436 Auxiliary Boiler Fuel Oil Tank	Aux. Boiler Fuel Oil Tank	N/A	12/09/96	N	N	N/A	N/A	N/A	N/A	Not required
Yard – Boiler Emergency D.G. Fuel Oil Tanks	Boiler Emerg. DG Fuel Oil Tanks	N/A	12/09/96	N	N	N/A	N/A	N/A	N/A	Not required
Yard – Construction Power Building 436	Construct. Power Building	N/A	12/10/96	N	N	N/A	N/A	N/A	N/A	Not required
Yard – Generator Hydrogen Storage	Gen. Hydrogen Storage	N/A	08/29/00	N	N	N/A	N/A	N/A	N/A	Not required
Yard – VCT & NSSS Hydrogen Storage	VCT & NSSS Hydrogen Storage	N/A	08/29/00	N	N	N/A	N/A	N/A	N/A	Not required

F. Fire-Induced Multiple Spurious Operations Resolution

4 Pages Attached

MSO Process Summary

The following process followed the guidance from FAQ 07-0038, Revision 1, and was adjusted with subsequent revisions during the MSO review process.

Step 1 – Identify potential MSOs of concern

Information sources that may be used as input include:

- Post-fire Appendix R safe shutdown analysis/Nuclear Safety Capability Assessment (NSCA).
- Generic lists of MSOs generated by the PWROG.
- Self assessment results (e.g., NEI 04-06 assessments performed to address RIS 2004-03).
- PRA insights (NEI 00-01 Rev 1, Appendix F).
- Operating Experience (e.g., licensee event reports, NRC Inspection Findings, etc.).

Results of Step 1:

A review of the sources listed above, and the initial table provided in Draft E PWROG Generic MSO list dated March 26, 2008, identified potential MSO combinations. This table is documented in the VCSNS Technical Report TR08620-025, "NFPA 805 Multiple Spurious Operations Report".

Step 2 – Conduct an expert panel to assess plant specific vulnerabilities (e.g., per NEI 00-01, Rev. 1 Section F.4.2).

The initial MSO list generated in Step 1 was then presented to a group of individuals who are considered "experts" in their field of discipline (i.e., plant transients, systems performance, safe shutdown, operation performance, etc.). The expert panel focused on system and component interactions that could impact the fire PRA risk models and nuclear safety.

Results of Step 2:

The MSO review was performed by an expert panel composed of a PRA engineer, Operations Engineer, Fire Protection Engineer, Systems Engineer, and an Electrical Engineer. The results are documented in VCSNS Technical Report TR08620-025, "NFPA 805 Multiple Spurious Operations Report". The physical location of the cables of concern for specific equipment being evaluated (e.g., fire zone/area routing of the identified MSO cables) was not considered for this step.

Step 3 – Update the Fire PRA model to include the MSOs of concern

Following completion of Step 2, the guidance for MSO review provided by FAQ 07-0038 Rev 2 was changed to cover both NSCA and Fire PRA models. Thus the PRA screening provided by Step 3 and Step 4 were not needed. The inclusion of MSOs in the Fire PRA is still needed.

Results of Step 3:

The results of the expert panel were included in the final component selection process and input into both the Fire PRA Model and NSCA. However, the original PRA screening function of Steps 3 and 4 was not done for MSOs, and instead were included directly into the NSCA model and evaluated for inclusion into the Fire PRA model.

Step 4 – Identify the risk significance of MSOs of concern

This step was not required in FAQ 07-0038 Rev 2 and 3.

Results of Step 4:

Per FAQ 07-0038 closeout (ML110140242) this step was not needed. The risk significance of the MSOs was not a consideration, and instead, the MSOs that were affected in each fire area were evaluated for risk impact as part of Steps 5 and 6.

Step 5 – Update the NSCA Fire SSCA

This step is a parallel of Step 3 for the deterministic analysis provided by the NSCA. As stated in Step 3, both the Fire PRA and NSCA models were modified to include MSO equipment/cables for the NSCA area-by-area compliance review and Fire PRA.

Results of Step 5:

The results of the expert panel were included in the final component selection process and input into the NSCA and Fire PRA Models. The results are documented in the Fire PRA Plant Final Report and NSCA.

Step 6 – Evaluate for NFPA 805 Compliance

The modification to the MSO process removed the PRA screening process originally set forth in Steps 3 and 4, and requires evaluation of all MSOs by both PRA and the NSCA. This analysis/evaluation step is performed for all MSOs using both deterministic and performance-based approach. The performance-based approach may include the use of feasible and reliable recovery actions with an acceptable Fire Risk Evaluation.

At this step, MSOs that met the separation/protection requirements were not given further consideration because compliance was met using deterministic methods.

MSOs that are not in compliance with NFPA 805 deterministic evaluation are identified by the open item process described in the NSCA, and were reviewed for other resolution options, such as plant modifications. MSOs that significantly impact PRA results were considered for modification in the PRA review process.

Results of Step 6:

The MSO combination components of concern were evaluated as part of the VCSNS NSCA and Fire PRA evaluations. For cases where the MSO components did not meet the deterministic compliance, the MSO combination components were evaluated for acceptability using performance based methods (e.g. RIPB fire risk evaluations) or modifications were proposed to prevent the MSO concern. The analysis results are an integral part of the NSCA and Fire Risk Evaluations.

Step 7 - Document Results

The documentation of the process and results of the Expert Panel Team Review was part of the original FAQ 07-0038 and has not changed. The generic list of MSOs for PWRs originally considered was modified and finalized during the review process and the expert panel comments and results are reported below.

Results of Step 7:

The results are documented in:

- VCSNS Design Calculation DC00340-001, "Fire PRA Plant Final Report,"
- VCSNS Technical Report TR08620-312, "Nuclear Safety Compliance Assessment,"
- VCSNS Technical Report TR08620-025, "NFPA 805 Multiple Spurious Operations Report."

G. Recovery Actions Transition

10 Pages Attached

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H. NFPA 805 Frequently Asked Question Summary Table

3 Pages Attached

Note: The NFPA 805 FAQ process will continue through the transition of non-pilot NFPA 805 transition plants. Final closure of the FAQs will occur when RG 1.205, which endorses the new revision of NEI 04-02, is approved by the NRC. It is expected that additional FAQs will be written and existing FAQs will be revised as the transition process continues.

This table includes the approved FAQs that have not been incorporated into the current endorsed revision of NEI 04-02 and reviewed and/or utilized in this submittal:

Table H-1 NEI 04-02 FAQs Reviewed and/or Utilized in LAR Submittal

No.	Rev.	Title	FAQ Ref.	Closure Memo
06-0007	3	Clarification on Plant Fire Brigades	ML071550408	ML072560733
06-0008	9	NFPA 805 Fire Protection Engineering Evaluations	ML090560170	ML073380976
06-0022	3	Acceptable Electrical Cable Construction Tests	ML090830220	ML091240278
07-0030	5	Establishing Recovery Actions	ML103090602	ML110070485
07-0032	2	Clarification of 10 CFR 50.48(c), 10 CFR 50.48(a) and GDC 3 clarification	ML081300697	ML081400292
07-0035	2	Bus Duct Counting Guidance for High Energy Arcing Faults	ML091610189	ML091620572
07-0038	3	Lessons learned on Multiple Spurious Operations	ML103090608	ML110140242
07-0039	2	Lessons Learned - NEI B-2 Table	ML091420138	ML091320068
07-0040	4	Non-Power Operations Clarification	ML082070249	ML082200528
08-0042	0	Fire Propagation from Electrical Cabinets	ML080230438 ML091460350	ML092110537
08-0043	1	Electrical Cabinet Fire Location	ML083540152 ML091470266	ML092120448
08-0044	0	Large Oil Fires	ML081200099 ML091540179	ML092110516
08-0046	0	Incipient Fire Detection Systems	ML081200120 ML093220197	ML093220426
08-0047	1	Spurious Operation Probability	ML082770662	ML082950750
08-0048	0	Fire Ignition Frequency	ML081200291 ML092180383	ML092190457
08-0049	0	Cable Fires	ML081200309 ML091470242	ML092100274
08-0050	0	Non Suppression Probability	ML081200318 ML092510044	ML092190555
08-0051	0	Hot Short Duration	ML083400188 ML100820346	ML100900052
08-0052	0	Transient Fire Growth Rate and Control Room Non-Suppression	ML081500500 ML091590505	ML092120501

Table H-1 NEI 04-02 FAQs Reviewed and/or Utilized in LAR Submittal

No.	Rev.	Title	FAQ Ref.	Closure Memo
08-0053[1]	0	Kerite Cable Classification	ML082660021 ML102100075	
07-0054[2]	1	Demonstrating Compliance with Chapter 4 of NFPA 805	ML103510379	ML110140183
09-0056	2	Radioactive Release Transition	ML102810600	ML102920405
09-0057	3	New Shutdown Strategy	ML100330863	ML100960568
10-0059[1]	2	NFPA 805 Monitoring	ML112340152	

Note 1: The FAQ has been submitted to the NRC for review/comment.

Note 2: The FAQ submittal number was 08-0054 but the NRC closure memo for the FAQ was listed as 07-0054. 07-0054 was used to be consistent with the Closure Memo.

I. Definition of Power Block

2 Pages Attached

During the plant partitioning effort, detailed in VCSNS Technical Report TR07870-018, "Fire PRA Plant Boundary Definition and Partitioning," VCSNS reviewed the structures in the Owner Controlled Area to determine those that contain equipment that is required to meet the nuclear safety criteria described in Section 1.5 of NFPA 805 or are required for nuclear plant operations.

Structures required to meet the radioactive release criteria described in Section 1.5 of NFPA 805 but are not required for nuclear plant operations are not defined as "power block," and therefore not listed in this attachment. Separate screening of structures was performed for the radioactive release review as discussed in Section 4.4 and Attachment E of the Transition Report.

For the purposes of establishing the structures included in the Fire Protection program in accordance with 10 CFR 50.48(c) and NFPA 805, plant structures listed in the following table are considered to be part of the power block.

Table I-1 – VCSNS Power Block Definition

Power Block Structures	Fire Area(s)
Reactor Building	RB
Auxiliary Building	AB
Fuel Handling Building	FH
Intermediate Building	IB
Control Building	CB
Diesel Generator Building	DG
Service Water Pump House	SWPH
Turbine Building	TB
Yard (includes targeted manhole areas)	YD and MH
Circulating Water Pump House	CWPH
Water Treatment Building	WTB
Radiological Maintenance Building	RMB
Auxiliary Boiler House	ABH
Storage Facilities for Hydrogen, Oxygen, Nitrogen, and CO_2	HCO2S and HNS
Potable Water Building	PWB
Alternate Fire Service Pump House	AFSPH
Switchyard	SWYD
Containment Access Building	CAB

J. Fire Modeling V&V

6 Pages Attached

1. Fire Models

The fire models listed in Table J-1 were used in the performance-based fire modeling analysis for selected fire areas of the plant. Table J-1 includes the model identification, the technical references for the model, and the validation work available for it. The selected models are listed in the draft Regulatory Guide DG-1218 published in March 2009 as acceptable to the NRC if each model used is shown to have been appropriately applied within the range of its applicability and V&V.

Table J-1 Fire Models used in the Analysis

Fire Model	Reference	Validation (Per NFPA 805 § 2.4.1.2.3)
Heskestad's Plume Temperature Correlation	NUREG 1805, Fire Dynamic Tools (FDT^s), Section 9.3.1	NUREG 1824, Vol 3, Section 6.2
Point Source Radiation Model	NUREG 1805, FDT^s, Section 5.3	NUREG 1824, Vol 3, Section 6.4
CFAST/Hot Gas Layer	NIST SP 1026, SP 1041	NUREG 1824, Vol 5, Section 6.1

1.1 Verification and Validation

Section 2.4.1.2.3 in NFPA 805 states that fire models "shall be verified and validated". NUREG 1824, referenced earlier in Table J-1, documents a verification and validation (V&V) study for the fire models listed in the table specifically for commercial nuclear power plant applications. The V&V results are summarized as follows.

Heskestad's Fire Plume Correlation: The Heskestad's model for plume temperature is based on appropriate empirical data. The model generally under-predicts plume temperature, outside of the experimental uncertainty, because of the effects of the hot gas layer on test measurements of plume temperature. The presence of a hot gas layer tends to increase the temperature in the plume, which is not accounted for in the model. Consequently, Heskestad's correlation is appropriate for predicting plume temperatures below the elevation of a hot gas layer, but is not appropriate for predicting plume temperatures within the hot gas layer.

Point Source Radiation Model and Solid Flame Radiation Model: The point source radiation and solid flame radiation models in general are based on appropriate empirical data and are physically appropriate with consideration of the simplifying assumptions. These models are not valid for elevations within a hot gas layer. The model predictions had no clear trends of under- or over-prediction, since values above and below the range of experimental uncertainty were observed. Finally, the point source radiation model is intended for predicting radiation from flames in an unobstructed and smoke-clear path between flames and targets.

Based on the results of this V&V study, flame radiation levels are calculated in this study considering "conservative" input values to account for the possible under-predictions that could be calculated. The conservatism in the input values account for these under predictions when the model is used within its stated capabilities.

CFAST/Hot Gas Layer Temperature: The CFAST predictions of the HGL temperature and height are within or close to experimental uncertainty, with a few exceptions. The CFAST predictions are typical of those found in other studies where the HGL temperature is typically somewhat over-predicted and HGL height somewhat lower (HGL depth somewhat thicker) than experimental measurements. These differences are likely attributable to simplifications in the model dealing with mixing between the layers, entrainment in the fire plume, and flow through vents. Still, predictions are mostly within 10% to 20% of experimental measurements. For the closed-door tests, calculated CFAST values are consistent with visual observations of smoke filling in the compartment.

1.2 Model Application Range

The V&V study documented in NUREG 1824 specifies a range of applicability for the validation results. This range of applicability is specified in terms of dimensionless parameters. That is, the range of model input parameters from the validation study are expressed in dimensionless terms so that fire modeling analysts can compare them with plant specific scenarios of different scales.

The dimensionless terms from NUREG 1824 are expressed in terms of a range. The methodology recommends that the analyst calculates the dimensionless groups for the scenario under analysis and determine if the validation results are applicable. Table J-2 summarizes the comparison between the fire area scenarios characteristics with the validation range. The comparison shows that in two cases the normalized parameters are outside of the validation range.

Table J-2 shows that for CB10 and CB12, the ratios of width/height (W/H) were just below the lower end of the range. To address the issue of being outside of the validation range, a sensitivity case was modeled for both fire areas. The height of the fire area was decreased until the ratio W/H was within the applicability limit, as shown below for CB10, which has a width of 3.47 m:

$$H_{eff} = \frac{W_{\text{fire zone}}}{\left(W/H_{\text{ Applicability limit}}\right)} = \frac{3.47}{0.6} = 5.8 \text{ m}$$

In this particular application, this algebraic manipulation results in an effective height of 5.8 m (rather than 8.0 m) for which the ratio of W/H falls within the range of V&V applicability limits. The adjusted height of the fire area conserves the length and width of the zone, but reduces the zone volume and reduces the area of all the surfaces in the fire area. These reductions result in hot gas layer temperature calculations that are conservative since less heat is required to raise the temperature of a smaller volume and less heat is lost through the reduced surface areas.

Table J-2 NUREG 1824 dimensionless group validation range analysis

Quantity	Normalized Parameter	Validation Range	In Range CB10	In Range CB12	In Range CB18	In Range IB11
Fire Froude Number[1] (CFAST); $\dot{Q}$ is fire size, ρ_∞ is ambient air density, c_p is specific heat of ambient air, T_∞ is ambient temperature, D is fire diameter, *g* is acceleration of gravity	$\dot{Q}^*=\frac{\dot{Q}}{\rho_\infty c_p T_\infty D^2\sqrt{gD}}$	0.4 – 2.4	Yes	Yes	Yes	Yes
Flame Length, L_f, relative to Ceiling Height[2], H (CFAST)	$\frac{L_f}{H}$ $L_f=D\left(3.7\,\dot{Q}^{*2/5}-1.02\right)$	0.2 – 1.0	Yes	Yes	Yes	Yes
Ceiling Jet Radial Distance, r_{cj}, relative to the Ceiling Height[3], H	N/A – Not used in this analysis	1.2 – 1.7	N/A	N/A	N/A	N/A
Equivalence Ratio[4], φ, as an indicator of the Ventilation Rate (CFAST); A_0 is door or vent area, H_0 is height of the door, $\dot{V}$ is mechanical ventilation rate	$\varphi=\frac{\dot{m}_F/\dot{m}_{O_2}}{r}\equiv\frac{\dot{Q}}{r\,\Delta H\,\dot{m}_{O_2}}$ $\dot{m}_{O_2}=0.23\times\frac{1}{2}A_0\sqrt{H_0}$ (Natural) $\dot{m}_{O_2}=0.23\,\rho_\infty\dot{V}$ (Mechanical)	0.04 – 0.6	Yes	Yes	Yes	Yes
Compartment Aspect Ratio[5], *L* is length, *W* is width, and *H* is Height of compartment	$\frac{L}{H}$ $\quad$ $\frac{W}{H}$	0.6 – 5.7	**No** (*W/H*=0.43)	**No** (*W/H*=0.46)	Yes	Yes
Target Distance, r, relative to the Fire Diameter[6], D	$\frac{r}{D}$	2.2 – 5.7	Yes	Yes	Yes	Yes

Notes:

1. This is a ratio of characteristic velocities. A typical accidental fire has a Froude number of order 1. Momentum-driven fire plumes, like jet flares, have relatively high values. Buoyancy-driven fire plumes have relatively low values.

2. A convenient parameter for expressing the "size" of the fire relative to the height of the compartment. A value of 1 means that the flames reach the ceiling.

3. Ceiling jet temperature and velocity correlations use this ratio to express the horizontal distance from the centerline of the fire plume to a target in the ceiling jet. This parameter is not-applicable in this analysis since ceiling jet temperature calculations are not performed.

4. The equivalence ratio relates the mass loss rate of fuel, $\dot{m}_F$, to the mass flow rate of oxygen into the compartment, $\dot{m}_{O_2}$. The fire is considered over or under-ventilated based on whether φ is less than or greater than 1, respectively. The parameter, r, is the stoichiometric ratio. In this application, for mechanical ventilation, the equivalence ratio calculation is conducted assuming the forced ventilation (when applicable) is operational until the temperature of the room is high enough to trigger the shutdown of the ventilation system. For the natural ventilation, the equivalence ratio calculation is conducted assuming one open door, which is not the normal operating ventilation condition for this fire area. Currently, no validation range is available for fire scenarios where the oxygen concentration is relatively low, as is the case in the evaluation documented in this report. However, the oxygen concentration is not a governing parameter in the conclusions of this study. That is, the maximum expected fire scenario results indicate that generated fire conditions (i.e. hot gas layer temperatures) are below the damage threshold regardless of the impact oxygen concentration may have in the heat release rate.

5. This parameter indicates the general shape of the compartment.

6. This ratio is the relative distance from a target to the fire. It is important when calculating the radiant (or radiative) heat flux, as targets are postulated in horizontal alignment with the fire source.

The results for the sensitivity cases are given in Table J-3. For the maximum expected scenarios for CB10 and CB12, the peak temperatures for both the original and sensitivity cases are below the performance criteria. In addition, for the limiting fire for CB12, the peak temperature is close to the performance criteria for the original and sensitivity case. Therefore, the conclusions made based on the fire modeling for those cases with parameters outside of the validation range are appropriate for this application.

Table J-3 Sensitivity Cases to Address Conditions Outside of V&V Range

Fire Area	Scenario	Sensitivity Case	Peak Temperature Original Case	Peak Temperature Sensitivity Case
CB10	Maximum expected Transient fire	Decreased H from 8.0 m to 5.8 m	141 °C (maximum)	161 °C (maximum)
CB12	Maximum expected and limiting transient fires	Decreased H from 8.0 m to 6.2 m	125 °C (maximum) 184 °C (limiting)	143 °C (maximum) 203 °C (limiting)

1.3 Documentation

The documentation supporting the NFPA 805 fire modeling, the V&V, and the model application range that are described in this attachment are included in station design calculations, as shown in Table J-4.

Table J-4 Design Calculations and Specific Sections Supporting Attachment J

Fire Area	Calculation Number	Fire Modeling	V&V	Model Application Range
CB10	DC0780F-096	Sections 7.2–7.4	Section 7.1.1	Section 7.1.2
CB12	DC0780F-097	Sections 7.2–7.4	Section 7.1.1	Section 7.1.2
CB18	DC0780F-103	Sections 7.2–7.4	Section 7.1.1	Section 7.1.2
IB11	DC0780F-173	Sections 7.2–7.4	Section 7.1.1	Section 7.1.2

K. Existing Licensing Action Transition

25 Pages Attached

Fire Area: AB01

LA-AB01-01 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Auxiliary Building - Lack of 20-ft separation and Automatic Suppression (III.G.2.b criteria)

Details: Redundant trains of CVCS functions are separated horizontally by less than 20-ft, with an automatic fire detection throughout the area and no fire suppression. AB-1.9 (400') – Train B cables and raceways.AB-1.10 (412'), AB-1.18 (436') and AB-1.21 (463') Train A cables and raceways

Basis: A Deviation request per the 5/28/1985 SCE&G submittal provides the following justification for the lack of 20-ft horizontal separation and lack of automatic suppression as required by Section III.G.2.b of Appendix R. This deviation was accepted by the NRC in a letter dated 7/27/1987:

- Train B cable in Fire Zone AB01.09 is separated from Train A cable in Zones AB01.10, AB01.18, and AB01.21 by one to three 3-hour rated barriers (floors) with unprotected openings
- Cable trays are provided with fire stops where they penetrate the floor
- Automatic detection in each affected fire zone
- Fire suppression is provided by interior manual hose stations and portable extinguishers

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-001, Attachment AB01-01

LA-AB01-02 **Transition to 805?** No **805 Comments:** No compliance strategy utilized in this area for NFPA 805 requires automatic suppression. This Approved Deviation does not need to be transitioned to NFPA 805.

Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)

Details: Deviation granted for lack of automatic suppression for areas in the Auxiliary and Intermediate Buildings

Basis: A Deviation request per the 6/1/1981 SCE&G submittal, as supplemented by the 7/16/1981 SCE&G letter to the NRC, provides justification for the lack of automatic suppression as required by Section III.G.2 of Appendix R. This deviation was accepted by the NRC in SSER 4 dated August 1982 for the following rooms:

- AB01.01.03 85-01
- AB01.07 88-25
- AB01.08.02 97-02
- AB01.04 00-02
- AB01.09
- AB01.10 12-11 North
- AB01.18.01 36-18
- AB01.30 85-01

FPEEE Reference: NA

Fire Area: AB01

LA-AB01-03 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Auxiliary Building - Lack of Automatic Suppression (III.G.2 criteria)

Details: Deviation granted for lack of full automatic suppression in fire zone AB01.21. Suppression installed in the south end hallway.

Basis: A Deviation request per the 6/1/1981 SCE&G submittal provides justification for the lack of full automatic suppression as required by Section III.G.2 of Appendix R. This deviation was accepted by the NRC in a letter dated October, 1983 for the following rooms:

- AB01.21

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-001, Attachment AB01-03

Fire Area: CB02

LA-CB02-01 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Control Building - Lack of 1-hour fire rated barrier (III.G.2.c criteria)

Details: Deviation granted for use of 1-hr rated cable in lieu of a 1-hr rated wrap.

Basis: A Deviation request per the 10/17/1996 SCE&G submittal, as supplemented by letters dated 5/1/1997 and 9/17/1997 provides the following justification for the lack of a 1-hour fire rated barrier as required by Section III.G.2.c of Appendix R. This deviation was accepted by the NRC in a letter dated 10/19/1997:

- Use of 1-hr rated Rockbestos Firezone R fire resistant cables in lieu of a 1-hr wrap.

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-001, Attachment CB02-01

Fire Area: CB12

LA-CB12-01 **Transition to 805?** No **805 Comments:** Circuits for INI00031 are no longer routed in CB12. This Approved Deviation does not need to be transitioned to NFPA 805.

Appendix R Deviation, Control Building - Lack of 1-hour fire rated barrier (III.G.2.c criteria)

Details: All three source range flux monitor instruments are affected in the same fire area.

Basis: A Deviation request per the 5/29/1985 SCE&G submittal provides the following justification for the lack of a 1-hour fire rated barrier as required by Section III.G.2.c of Appendix R. This deviation was accepted by the NRC in a letter dated 5/22/1986:

• Provide 1-hour fire barrier to enclose one train of source range flux cabling, or provide power selector switch to allow backup power to affected source range flux cabling.

FPEEE Reference: NA

Fire Area: CB17

LA-CB17-01 **Transition to 805?** No **805 Comments:** A Performance Based analysis has been performed in this area and it has been determined that automatic suppression is not required. This Approved Deviation does not need to be transitioned to NFPA 805.

Appendix R Deviation, Control Building - Lack of Automatic Suppression (III.G.3 criteria)

Details: Control Room does not have a fixed suppression system

Basis: A Deviation request per the 7/16/1981 SCE&G submittal provides justification for the lack of automatic suppression as required by Section III.G.2 of Appendix R. This deviation was accepted by the NRC in SSER 3 dated, January 1982:

- 3 hr rated fire area boundaries (ceiling, floor and walls)
Support areas within the CR area are separated by noncombustible partitions (floor to ceiling)
- Smoke detection covers entire control room area, in the ventilation ducts and in the MCB and other cabinets which contain redundant cables
- Standpipe hose stations and portable extinguishers are provided for manual fire suppression activities
- Control room support separated from CR by 1-hour fire barriers (floor to ceiling), above suspended ceiling or an automatic sprinkler system will be provided

FPEEE Reference: NA

Fire Area: IB03

LA-IB03-01 **Transition to 805?** No **805 Comments:** All RCS Temperature for indication at the MCB is embedded in IB03. Embedded conduits are evaluated in TR0780E-001 to meet the deterministic requirements of NFPA 805. This Approved Deviation does not need to be transitioned to NFPA 805.

Appendix R Deviation, Intermediate Building - Lack of 3-hour fire rated barrier (III.G.2.a criteria)

Details: Redundant power for Th and Tc not separated by 3 hours. RCS temperature indicators Thot and Tcold on the same SG loop are powered from different power trains.

Basis: A Deviation request per the 5/29/1985 SCE&G submittal, as supplemented by 9/4/1985, 11/1/1985, and 4/23/1986 SCE&G letters to the NRC, provides the following justification for Lack of a 3-hour fire rated barrier as required by Section III.G.2.a of Appendix R. This deviation was accepted by the NRC in a letter dated 11/26/1986:

- Either Channel A or Channel B Core exit thermocouples (T/C) will also be available in the four fire zones (2 per quadrant). Alternate methods to determine the existence of natural circulation cooling.
- Direct Method - Utilize SG pressure as a substitute for Tcold
- Indirect Method - Use RCS temperature (Thot), RCS pressure, and steam tables to assure RCS is subcooled and water solid.

FPEEE Reference: NA

Fire Area: IB04

LA-IB04-01 **Transition to 805?** No **805 Comments:** No compliance strategy utilized in this area for NFPA 805 requires automatic suppression. This Approved Deviation does not need to be transitioned to NFPA 805.

Appendix R Deviation, Intermediate Building - Lack of 3-hour fire rated barrier (III.G.2.a criteria)

Details: Redundant power for Th and Tc not separated by 3 hours. RCS temperature indicators Thot and Tcold on the same SG loop are powered from different power trains.

Basis: A Deviation request per the 5/29/1985 SCE&G submittal, as supplemented by 9/4/1985, 11/1/1985, and 4/23/1986 SCE&G letters to the NRC, provides the following justification for Lack of a 3-hour fire rated barrier as required by Section III.G.2.a of Appendix R. This deviation was accepted by the NRC in a letter dated 11/26/1986:

- Either Channel A or Channel B Core exit thermocouples (T/C) will also be available in the four fire zones (2 per quadrant). Alternate methods to determine the existence of natural circulation cooling.
- Direct Method - Utilize SG pressure as a substitute for Tcold
- Indirect Method - Use RCS temperature (Thot), RCS pressure, and steam tables to assure RCS is subcooled and water solid.

FPEEE Reference: NA

Fire Area: IB07

LA-IB07-01 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Intermediate Building - Lack of 20-ft separation (III.G.2.b criteria)

Details: All three HVAC chill Water Pumps in the same Fire Area

Basis: A Deviation request per the 6/1/1981 SCE&G submittal provides justification for the lack of 20-ft separation as required by Section III.G.2 of Appendix R. This Deviation was accepted by the NRC in SSER 3 dated, January 1982:

- Automatic sprinkler system installed
- Fire detection system installed
- 1-hr rated radiant shield walls between all three pumps to divide the room into three areas (one CW pump required)
- 1-hr rated fire barrier for cable from one division which passes through the pump area for another division

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-001, Attachment IB07-01

Fire Area: IB10

LA-IB10-01	**Transition to 805?** No	**805 Comments:**	A Performance Based analysis has been performed in this area and it has been determined that automatic suppression is not required. This Approved Deviation does not need to be transitioned to NFPA 805.

Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)

Details: Deviation granted for lack of automatic suppression for areas in the Auxiliary and Intermediate Buildings

Basis: A Deviation request per the 6/1/1981 SCE&G submittal, as supplemented by the 7/16/1981 SCE&G letter to the NRC, provides justification for the lack of automatic suppression as required by Section III.G.2 of Appendix R. This deviation was accepted by the NRC in SSER 4 dated August 1982 for the following rooms:

- IB10 23-02

FPEEE Reference: NA

Fire Area: IB11

LA-IB11-01 **Transition to 805?** No **805 Comments:** A Performance Based analysis has been performed in this area and it has been determined that automatic suppression is not required. This Approved Deviation does not need to be transitioned to NFPA 805.

Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)

Details: Deviation granted for lack of automatic suppression for areas in the Auxiliary and Intermediate Buildings

Basis: A Deviation request per the 6/1/1981 SCE&G submittal, as supplemented by the 7/16/1981 SCE&G letter to the NRC, provides justification for the lack of automatic suppression as required by Section III.G.2 of Appendix R. This deviation was accepted by the NRC in SSER 4 dated August 1982 for the following rooms:

- IB11 26-01

FPEEE Reference: NA

Fire Area: IB12

LA-IB12-01 **Transition to 805?** No **805 Comments:** No compliance strategy utilized in this area for NFPA 805 requires automatic suppression. This Approved Deviation does not need to be transitioned to NFPA 805.

Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)

Details: Deviation granted for lack of automatic suppression for areas in the Auxiliary and Intermediate Buildings

Basis: A Deviation request per the 6/1/1981 SCE&G submittal, as supplemented by the 7/16/1981 SCE&G letter to the NRC, provides justification for the lack of automatic suppression as required by Section III.G.2 of Appendix R. This deviation was accepted by the NRC in SSER 4 dated August 1982 for the following rooms:

- IB12 26-02

FPEEE Reference: NA

Fire Area: IB16

LA-IB16-01 **Transition to 805?** No **805 Comments:** No compliance strategy utilized in this area for NFPA 805 requires automatic suppression. This Approved Deviation does not need to be transitioned to NFPA 805.

Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)

Details: Deviation granted for lack of automatic suppression for areas in the Auxiliary and Intermediate Buildings

Basis: A Deviation request per the 6/1/1981 SCE&G submittal, as supplemented by the 7/16/1981 SCE&G letter to the NRC, provides justification for the lack of automatic suppression as required by Section III.G.2 of Appendix R. This deviation was accepted by the NRC in SSER 4 dated August 1982 for the following rooms:

- IB16 51-01

FPEEE Reference: NA

Fire Area: IB17

LA-IB17-01 **Transition to 805?** No **805 Comments:** No compliance strategy utilized in this area for NFPA 805 requires automatic suppression. This Approved Deviation does not need to be transitioned to NFPA 805.

Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)

Details: Deviation granted for lack of automatic suppression for areas in the Auxiliary and Intermediate Buildings

Basis: A Deviation request per the 6/1/1981 SCE&G submittal, as supplemented by the 7/16/1981 SCE&G letter to the NRC, provides justification for the lack of automatic suppression as required by Section III.G.2 of Appendix R. This deviation was accepted by the NRC in SSER 4 dated August 1982 for the following rooms:

- IB17 51-02

FPEEE Reference: NA

Fire Area: IB19

LA-IB19-01 **Transition to 805?** No **805 Comments:** No compliance strategy utilized in this area for NFPA 805 requires automatic suppression. This Approved Deviation does not need to be transitioned to NFPA 805.

Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)

Details: Deviation granted for lack of automatic suppression for areas in the Auxiliary and Intermediate Buildings

Basis: A Deviation request per the 6/1/1981 SCE&G submittal, as supplemented by the 7/16/1981 SCE&G letter to the NRC, provides justification for the lack of automatic suppression as required by Section III.G.2 of Appendix R. This deviation was accepted by the NRC in SSER 4 dated August 1982 for the following rooms:

- IB19 51-03

FPEEE Reference: NA

Fire Area: IB24

LA-IB24-01 **Transition to 805?** No **805 Comments:** No compliance strategy utilized in this area for NFPA 805 requires automatic suppression. This Approved Deviation does not need to be transitioned to NFPA 805.

Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)

Details: Deviation granted for lack of automatic suppression for areas in the Auxiliary and Intermediate Buildings

Basis: A Deviation request per the 6/1/1981 SCE&G submittal, as supplemented by the 7/16/1981 SCE&G letter to the NRC, provides justification for the lack of automatic suppression as required by Section III.G.2 of Appendix R. This deviation was accepted by the NRC in SSER 4 dated August 1982 for the following rooms:

- IB24 36-03B

FPEEE Reference: NA

Fire Area: IB25

LA-IB25-01 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Intermediate Building - Lack of 20-ft separation (III.G.2.b criteria)

Details: Redundant CC Pumps located in the same fire area with insufficient horizontal separation.

Basis: A Deviation request per the 6/1/1981 SCE&G submittal provides justification for the lack of automatic suppression as required by Section III.G.2 of Appendix R. This deviation was accepted by the NRC in SSER 3 dated, January 1982:

- Smoke detection system installed
- Sprinkler system to cover CC pumps and extend at least 15-ft beyond each pump (subsequently, full automatic suppression was installed throughough the area)
- 1-hr fire rated barrier on one division if redundant separation is less than 20-ft of clear space (no combustibles)
- 10-ft high radiant heat shield wall constructed of drywall between pumps B and C. (only one CC pump required)

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-001, Attachment IB25-02

LA-IB25-02 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Intermediate Building - Lack of 1-hour fire rated barrier (III.G.2.c criteria)

Details: Redundant trains of SW Booster Pump required support circuits are separated horizontally by 12-ft and by a reinforced concrete wall with unprotected openings. IB-25.1 – Train A equipment and cables. IB-25.10 – Train B power and control cables for the DG (causes loss of onsite power to Train B SW Booster Pump).

Basis: A Deviation request per the 5/29/1985 SCE&G submittal provides the following justification for the lack of a 1-hour fire rated barrier as required by Section III.G.2.c of Appendix R. This deviation was accepted by the NRC in a letter dated 7/27/1987:

- Redundant circuits are separated horizontally by 12-ft and by a reinforced concrete wall with unprotected openings.
- Automatic suppression and detection in fire zone IB25.01
- Automatic detection in Train B cable chase
- 3-hr fire barrier with unprotected openings around Train B cable chase

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-001, Attachment IB25-03

Fire Area: IB25

LA-IB25-03 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Intermediate Building - Radiant energy shield in lieu of a 1-hour fire rated barrier (III.G.2.c criteria)

Details: Radiant Energy shield installed using 1-inch thick B&W Kaowool "M" board horizontal fire barrier (20' x 20' square) separating A SWBP XPP0045A and B train cables in cable trays above.

Basis: A Deviation request per the 9/20/1985 SCE&G submittal, as supplemented by the 12/30/1985 SCE&G letter to the NRC, provides the following justification for a radiant energy shield in lieu of a of a 1-hour fire rated barrier as required by Section III.G.2.c of Appendix R. This deviation was accepted by the NRC in a letter dated 5/22/1986:

- Pre-action sprinklers above and below the M-board.
- ½ diameter hanger rods enclosed with ½" wall thickness of Thermo-Lag 330-1 split tubing equivalent to 1-hr fire rated barrier.
- Coat surfaces of Unitstrut with TSI material (trowel grade or flexible wrap) equivalent to a 1-hr fire rated barrier.
- Fusible-type water spray nozzles are provided for cable tray stacks in the overhead
- Fire area protected by automatic fire detection and suppression.
- Top part of "M" board is covered by 1/16" thick fire-retardant "Tuff Span" sheeting to provide mechanical damage protection.
- Pipe penetrations are sealed with kaowool blankets.

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-001, Attachment IB25-03

LA-IB25-04 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Intermediate Building - Lack of 3-hour fire rated barrier (III.G.2.a criteria)

Details: Redundant power for Th and Tc not separated by 3 hours. RCS temperature indicators Thot and Tcold on the same SG loop are powered from different power trains.

Basis: A Deviation request per the 5/29/1985 SCE&G submittal, as supplemented by 9/4/1985, 11/1/1985, and 4/23/1986 SCE&G letters to the NRC, provides the following justification for Lack of a 3-hour fire rated barrier as required by Section III.G.2.a of Appendix R. This deviation was accepted by the NRC in a letter dated 11/26/1986:

- Either Channel A or Channel B Core exit thermocouples (T/C) will also be available in the four fire zones (2 per quadrant). Alternate methods to determine the existence of natural circulation cooling.
- Direct Method - Utilize SG pressure as a substitute for Tcold.
- Indirect Method - Use RCS temperature (Thot), RCS pressure, and steam tables to assure RCS is subcooled and water solid.

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-001, Attachment IB25-05

Fire Area: IB25

LA-IB25-05 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)

Details: Deviation granted for lack of automatic suppression for areas in the Auxiliary and Intermediate Buildings

Basis: A Deviation request per the 6/1/1981 SCE&G submittal, as supplemented by the 7/16/1981 SCE&G letter to the NRC, provides justification for the lack of automatic suppression as required by Section III.G.2 of Appendix R. This deviation was accepted by the NRC in SSER 4 dated August 1982 for the following rooms:

- IB25.06.01 PA 36-02

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-001, Attachment IB25-06

LA-IB25-06 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Intermediate Building - Lack of 1-hour fire rated barrier (III.G.2.c criteria)

Details: Cabling for Train A DC control power to all SSD systems (3088) are less than 20-ft horizontal separation from Train B cabling for Chilled Water and CCW systems. Installation of 1-hour rated cable in lieu of a 1-hour barrier.

Basis: A Deviation request per the 10/17/1996 SCE&G submittal, as supplemented by letters dated 5/1/1997 and 9/17/1997 provides the following justification for the lack of a 1-hour fire rated barrier as required by Section III.G.2.c of Appendix R. This deviation was accepted by the NRC in a letter dated 10/19/1997:

- 1-hr cables installed in lieu of enclosing Train A tray 3088 in 1-hour fire wrap throughout FA IB-25

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-001, Attachment IB25-01

Fire Area: MH02

LA-MH02-01 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Man Hole - Lack of 3-hour fire rated barrier (III.G.2.a criteria)

Details: Redundant trains for SW Pump House are not separated by a fire barrier having 3-hour fire rating. MH-2.1 – contains A train, MH-2.2 – contains B train.

Basis: A Deviation request per the 5/28/1985 SCE&G submittal provides the following justification for the lack of a 3-hour fire rated barrier as required by Section III.G.2.a of Appendix R. This deviation was accepted by the NRC in a letter dated 7/27/1987:

- MH-2.1 and MH-2.2 separated by 6" concrete wall with a 4" pipe opening at the base for drainage.
- 2-ft thick concrete manhole cover.
- Low combustible loading consisting of cable insulation only.
- Entry of transient combustible is precluded by manhole cover.

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-001, Attachment MH02-01

Fire Area: RB01

LA-RB01-01 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Intermediate Building - Lack of 3-hour fire rated barrier (III.G.2.a criteria)

Details: Redundant power for Th and Tc not separated by 3 hours. RCS temperature indicators Thot and Tcold on the same SG loop are powered from different power trains.

Basis: A Deviation request per the 5/29/1985 SCE&G submittal, as supplemented by 9/4/1985, 11/1/1985, and 4/23/1986 SCE&G letters to the NRC, provides the following justification for Lack of a 3-hour fire rated barrier as required by Section III.G.2.a of Appendix R. This deviation was accepted by the NRC in a letter dated 11/26/1986:

- Either Channel A or Channel B Core exit thermocouples (T/C) will also be available in the four fire zones (2 per quadrant). Alternate methods to determine the existence of natural circulation cooling.
- Direct Method - Utilize SG pressure as a substitute for Tcold.
- Indirect Method - Use RCS temperature (Thot), RCS pressure, and steam tables to assure RCS is subcooled and water solid.

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-001, Attachment RB01-01

Fire Area: SWPH05

LA-SWPH05-01 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Service Water Pump House - Lack of Automatic suppression and Detection (III.G.2.b criteria)

Details: Approval of lack of automatic suppression in the Discharge Valve rooms and Fire Detection only in room 25-03.

Basis: A Deviation request per the 7/16/1981 SCE&G submittal, as supplemented by 4/20/1982 and 12/1/1982 SCE&G letters to the NRC, provides the following justification for Lack of 20ft separation as required by Section III.G.2.b of Appendix R. This deviation was accepted by the NRC in a SSER 3 dated January, 1982:

- Substantial radiant energy shields of concrete construction between pumps.
- Substantial barriers and enclosed rooms with limited access for all discharge valves.
- There is at least 9'-0" of physical horizontal separation from the "C" Pump to either the Train "A or B" Pumps.
- There is very limited combustible loading in these fire zones.

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-001, Attachment SWPH05-01

Fire Area: Various

LA-FEAT-04 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Intermediate Building - Lack of 3-hour fire rated door (III.G.2.a criteria)

Details: Doors places in a 3-hour barrier do not have full 3-hour fire ratings. Substantial bullet-proof, high pressure construction were found to be acceptable in the areas where they were used.

Basis: A Deviation request per the 11/30/1978 SCE&G submittal (FPER response to NRC Questions) provides the following justification for the lack of a 3-hour fire rated barrier as required by Section III.G.2.a of Appendix R. This deviation was accepted by the NRC in a SSER 3 dated January, 1982:

- Bullet resistant and pressure doors.
- Manufactured of similar materials and construction to rated fire doors.
- Doors do not have any openings or ports, and are self closing.

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-006, Attachment FEAT-04

LA-FEAT-05 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Intermediate Building - Lack of 3-hour fire rated damper (III.G.2.a criteria)

Details: Back-to-back dual 1.5 hour rated fire dampers in lieu of a 3 hour rated fire damper are expected to perform in an adequate manner during a fire.

Basis: A Deviation request per the 11/30/1978 SCE&G submittal (FPER response to NRC Questions) provides the following justification for the lack of a 3-hour fire rated barrier as required by Section III.G.2.a of Appendix R. This deviation was accepted by the NRC in a SSER 3 dated January, 1982:

- Dual 1.5 hour rated fire damper in lieu of a 3 hour rated damper.
- Automatic detection installed in areas where these dampers and low fire loading exists.
- Automatic detection and suppression installed in areas where these dampers and high fire loading exists.

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-006, Attachment FEAT-05

Fire Area: YD01

LA-YD01-01 **Transition to 805?** No **805 Comments:** A Performance Based analysis has been performed in this area and it has been determined that detection is not required. This Approved Deviation does not need to be transitioned to NFPA 805.

Appendix R Deviation, Various Areas - Lack of Automatic Fire Detection (III.F criteria)

Details: Table 9-1 of SSER 4 lists Building and Room numbers where Deviation is granted to Not have Detectors installed

Basis: A Deviation request per the 4/20/1982 SCE&G submittal provides justification for the lack of automatic detection as required by Section III.F of Appendix R. This deviation was accepted by the NRC in SSER 4 dated, August 1982 for the following rooms:

- YD01

FPEEE Reference: NA

Fire Area: YD02

LA-YD02-01 **Transition to 805?** Yes **805 Comments:** This Licensing Action is credited in the NSCA and is to be transitioned into NFPA 805.

Appendix R Deviation, Various Areas - Lack of Automatic Fire Detection (III.F criteria)

Details: Table 9-1 of SSER 4 lists Building and Room numbers where Deviation is granted to Not have Detectors installed

Basis: A Deviation request per the 4/20/1982 SCE&G submittal provides justification for the lack of automatic detection as required by Section III.F of Appendix R. This deviation was accepted by the NRC in SSER 4 dated, August 1982 for the following rooms:

- YD02

FPEEE Reference: Post-transition bases for acceptability, see TR0780E-001, Attachment YD02-01

LA-YD02-02 **Transition to 805?** No **805 Comments:** Human Reliability Analysis includes factors such as lack of emergency lighting in NFPA 805. Licensing action for lack of Emergency Lighting not required to be transitioned to NFPA 805.

Appendix R Modification, Yard Areas - Lack of 8-hr battery backed emergency lighting (III.J criteria)

Details: Use of yard lighting powered from diesel generators buses for operator egress to/from Turbine Building to SW Pump house, and external entrances and exits to both buildings.

Basis: A proposed Modification per the 5/29/1985 SCE&G submittal provides the following justification for the lack of lack of 8-hr battery backed emergency lighting Section III.J of Appendix R. This modification was accepted by the NRC in a letter dated 5/22/1986:

- Current yard lighting is inspected and maintained as part of security requirements. Flashlights may be used to supplement yard lighting, but yard lighting should be sufficient.

FPEEE Reference: NA

L. NFPA 805 Chapter 3 Requirements for Approval (10 CFR 50.48(c)(2)(vii))

14 Pages Attached

Approval Request L1

NFPA 805 Section: 3.3.1.2 (1) Wood

Request: Approval is requested for use of non-treated wood in limited quantities. While the code section is prescriptive in the transient use of treated wood/lumber, VCSNS may experience field conditions where non-treated wood may be needed to address unique situations during plant operations or during outages.

Basis for Request: There is recognition that requirements concerning the control of transient wood/ lumber are managed within the bounds of the VCSNS site administrative controls and within the Fire Protection Program. However there may be instances where minor non-compliances of use of non-treated wood in limited quantities may be necessary. Administrative procedures may permit this condition based on added compensatory measures, additional engineering approvals or other administrative actions to manage the conditions and minimize the risk. Managing plant conditions and protecting safe shutdown systems in risk significant areas with preventive measures and/or administrative controls is within the requirements and responsibilities of the Fire Protection Program.

Acceptance Criteria Evaluation:

Nuclear Safety and Radiological Release Performance Criteria:
The use of limited amounts of untreated wood in selected risk significant areas is restricted by administrative and engineering procedures with suitable fire protection features present in the area that ensure for the control of transient combustibles, separation distance, suppression, fire barriers and protection of the nuclear safety performance criteria as applicable and identified by VCSNS and NFPA 805 Section 1.5. Use of combustible materials such as wood in a radiological area is closely reviewed and limited due to potential effects of fire and ALARA. There is no nuclear safety or radiological concern from transient non-treated wood that is not under strict review and controls.

Safety Margin and Defense-in-Depth:
The margin of safety that is inherent within the NFPA 805 Fire PRA and performance based review is acceptable to ensure that no conditions are inadvertently produced that would challenge the ability of the fire protection features individually and or combined as defense-in-depth. There would be no effect on active fire suppression activities and these transient conditions would be within the limitations and assumptions of the Fire PRA.

Conclusion:
VCSNS determined that the Fire Protection Program engineering and administrative features and controls provide a level of risk management and performance that achieves the following criteria:

- Satisfies the performance goals performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;
- Maintains safety margins; and
- Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

Approval Request L2

NFPA 805 Section: 3.3.5.1 Wiring

Request: Approval is requested for existing wiring in suspended ceilings. While the code section is prescriptive in the use and limitation of exposed electrical wire above suspended ceilings, there is existing wiring for non-essential, non-risk significant areas and systems such as lighting and electrical power outlets that may not meet the literal requirements of this section for those limited areas of the plant with suspended ceilings.

Basis for Request: Station specifications govern the installation of wiring above suspended ceilings. Wiring is specified to be within metal conduits, cable trays, armored cable or rated for plenum use. The use of suspended ceilings is limited in risk significant areas important to the NSCA, Fire PRA and NPO analysis.

Acceptance Criteria Evaluation:

Nuclear Safety and Radiological Release Performance Criteria:
The use of limited amounts of wiring above suspended ceilings in selected risk significant areas is restricted by engineering specifications and procedures with suitable fire protection features present in the area that ensure for the control of combustibles, separation distance, suppression, fire barriers and protection of the nuclear safety performance criteria as applicable and identified by VCSNS and NFPA 805 Section 1.5. The existence of wiring above suspended ceilings or in a radiological area is closely reviewed and limited due to potential effects of fire and ALARA. There is no nuclear safety or radiological concern from wiring above suspended ceilings that is not under strict review and engineering controls.

Safety Margin and Defense-in-Depth:
The margin of safety that is inherent within the NFPA 805 Fire PRA and performance based review and is acceptable to ensure that no conditions are inadvertently produced that would challenge the ability of the fire protection features individually and or combined as defense-in-depth. There would be no effect on active fire suppression activities and would be within the limitations and assumptions of the Fire PRA.

Conclusion:
VCSNS determined that the Fire Protection Program engineering and administrative features and controls provide a level of risk management and performance that achieves the following criteria:

- Satisfies the performance goals performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;
- Maintains safety margins; and
- Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

Approval Request L3

NFPA 805 Section 3.3.5.3 Electrical Cable Construction

Request: Clarification and approval for existing non-compliant cable and the identified alternative flame propagation tests and controls which may have more rigorous acceptance criteria than IEEE 383-1991. Cables tested by more current test methods may have similar or better flame propagation resistance than if tested by IEEE 383-1974 test method. These alternative flame propagation test methods may be utilized when verifying and validating new electrical cable when purchased at VCSNS prior to field installation.

Basis for Request: This IEEE 383 standard was selected as the baseline since it has been previously referenced as the US NRC minimum test standard and acceptance criteria for cable flame propagation tests. The NRC provided alternative test standards as input to an industry FAQ 06-0022 generated by the NFPA 805 transition process. The staff has reviewed the proposed FAQ as a change to NEI 04-02 as presented in FAQ 06-0022, Revision 3 and finds that nothing in this FAQ would prevent continued endorsement of NEI 04-02. In accordance with RIS 2007-19, the guidance in this FAQ is acceptable for use by licensees in transition.

Acceptance Criteria Evaluation:

Nuclear Safety and Radiological Release Performance Criteria:
The use of existing (Test Methods) and/or new test methods to assess the behavior of assemblies and/or materials is always developing with technology and would not present a nuclear safety or radiological concern from utilizing an alternative approach that is performance based. These are reviewed by a qualified fire protection engineer(s) that is knowledgeable with the Fire PRA methodology and the risk significant areas of the plant.

Safety Margin and Defense-in-Depth:
The margin of safety that is inherent within the NFPA 805 Fire PRA and performance based review and is acceptable to ensure that no conditions are inadvertently produced that would challenge the ability of the fire protection features individually and or combined as defense-in-depth. There would be no effect on active fire suppression activities and would be within the limitations and assumptions of the Fire PRA.

Conclusion:
VCSNS determined that the Fire Protection Program engineering and administrative features and controls provide a level of risk management and performance that achieves the following criteria:

- Satisfies the performance goals performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;
- Maintains safety margins; and
- Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

Approval Request L4

NFPA 805 Section: 3.3.7.2 Bulk Gas Storage

Request: Approval is requested for the existing horizontal hydrogen storage tanks (one location) that are perpendicular to the Turbine Building/Control Building. The request is based on approximately 240 feet of separation distance. The substantial distance of the hydrogen storage tanks from the Turbine and Control buildings is an alternative approach to the prescriptive requirement of the code regarding the orientation of the tank axis.

Basis for Request: The bulk high pressure flammable hydrogen storage containers are located such that the long axis is perpendicular to the Turbine Building, however there is a substantial distance from the Turbine Building Structure (approximately 240 feet), and other missile protected safety related structures.

Acceptance Criteria Evaluation:

Nuclear Safety and Radiological Release Performance Criteria:
These tanks are located in the exterior yard and there is no radiological or nuclear safety concern.

Safety Margin and Defense-in-Depth:
The margin of safety that is inherent within the NFPA 805 Fire PRA and performance based review is acceptable to ensure that no conditions are inadvertently produced that would challenge the ability of the fire protection features individually and or combined as defense-in-depth. There would be no effect on active fire suppression activities and would be within the limitations and assumptions of the Fire PRA.

Conclusion:
VCSNS determined that the Fire Protection Program engineering and administrative features and controls provide a level of risk management and performance that achieves the following criteria:

- Satisfies the performance goals performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;
- Maintains safety margins; and
- Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

Approval Request L5

NFPA 805 Section 3.4.1 (d) Fire Brigade Notification

Request: Clarification and approval is requested for the sequence of fire brigade notification upon verification of a fire. Verification could be accomplished by several methods and at VCSNS verification is made by direct visual contact with the fire and/or products of combustion and with direct communication to the control room.

Basis for Request: This approach allows the immediate dispatch of someone from operations to the scene of the alarm signal, perform verification and begin to assess the status and potential effects to nuclear safety. That action is the verbal confirmation back to the control room that dispatches the fire brigade and brigade leader with knowledge of its specific location and its potential. This allows brigade members and the control room immediate and credible information to act without delay to alleviate smoke and heat conditions, protect equipment and advance hose lines, as necessary.

Acceptance Criteria Evaluation:

Nuclear Safety and Radiological Release Performance Criteria:
The sequence of notification that is performed allows for expedited strategic response to conditions and would not impact a nuclear safety or create a radiological concern from utilizing an alternate approach that is effective and performance based.

Safety Margin and Defense-in-Depth:
The margin of safety that is inherent within the NFPA 805 Fire PRA and performance based review and is acceptable to ensure that no conditions are inadvertently produced that would challenge the ability of the fire protection features individually and or combined as defense-in-depth. There would be no effect on active fire suppression activities and would be within the limitations and assumptions of the Fire PRA.

Conclusion:
VCSNS determined that the Fire Protection Program engineering and administrative features and controls provide a level of risk management and performance that achieves the following criteria:

- Satisfies the performance goals performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;
- Maintains safety margins; and
- Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

Approval Request L6

NFPA 805 Section: 3.4.2.4 Pre-Fire Plans

Request: Clarification and approval is requested for the use of multiple procedures to coordinate the fire brigade activities with other groups. The pre-fire plan, emergency procedures and brigade leader training assures the required coordination. The use of pre-fire plans considers the coordination of support groups and training is provided in many scenarios that would include a variety of other groups. In some instances in drills and/or in an ongoing event the need to interact with specific groups would be driven on variables that may not be predictable.

Basis for Request: The Station Emergency Plan (EP) procedures and Fire Brigade Leader Training discuss coordination with other groups during fire emergencies. The coordination with support groups may not be located within the context of nor need to be located within the "Pre Fire Plans". In addition to the Pre-fire Plan procedures, the EP procedures may be considered in part a pre-plan to a fire event, which addresses such interfaces and support.

Acceptance Criteria Evaluation:

Nuclear Safety and Radiological Release Performance Criteria:
The procedural location of specific coordination of a fire support group(s) would not impact a nuclear safety or create a radiological concern from utilizing an alternate approach that is effective and performance based.

Safety Margin and Defense-in-Depth:
The margin of safety that is inherent within the NFPA 805 Fire PRA and performance based review and is acceptable to ensure that no conditions are inadvertently produced that would challenge the ability of the fire protection features individually and or combined as defense-in-depth. There would be no effect on active fire suppression activities and would be within the limitations and assumptions of the Fire PRA.

Conclusion:
VCSNS determined that the Fire Protection Program engineering and administrative features and controls provide a level of risk management and performance that achieves the following criteria:

- Satisfies the performance goals performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;
- Maintains safety margins; and
- Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

Approval Request L7

NFPA 805 Section: 3.4.3 (a)(4) Records

Request: Clarification and approval is requested for the use of electronic records and or written records that document fire brigade member training. The code specifically states "written records" are necessary. At VCSNS, the primary storage medium for these training records is electronic, and "written records" are typically not maintained. The subject Training Records may be paperless media that is available and controlled by the station's Record Management System.

Basis for Request: Electronic Records are maintained for each Fire Brigade Member consistent with the intent of the code requirement. These training activities include, but are not limited to, classroom sessions, fire school, drills and other related topics. This alternate method of maintaining records is effective.

Acceptance Criteria Evaluation:

Nuclear Safety and Radiological Release Performance Criteria:
The storage medium of records would not impact a nuclear safety or create a radiological concern from utilizing an alternate approach that is effective and performance based.

Safety Margin and Defense-in-Depth:
The margin of safety that is inherent within the NFPA 805 Fire PRA and performance based review and is acceptable to ensure that no conditions are inadvertently produced that would challenge the ability of the fire protection features individually and or combined as defense-in-depth. There would be no effect on active fire suppression activities and would be within the limitations and assumptions of the Fire PRA.

Conclusion:
VCSNS determined that the Fire Protection Program engineering and administrative features and controls provide a level of risk management and performance that achieves the following criteria:

- Satisfies the performance goals performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;
- Maintains safety margins; and
- Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

Approval Request L8

NFPA 805 Section: 3.5.15 Yard Fire Hydrant Layout

Request: Approval is requested for the existing layout of yard fire hydrants at the station. The request is based on an average of approximately 325 feet of separation between hydrants protecting building and structures within the Protected Area. This average distance does not include current spacing of the west perimeter of the powerblock and the Switchyard.

Basis for Request: It is the intent of this requirement (as specified in NFPA 24-1973) to locate fire hydrants such that a sufficient number of hydrants are provided for exterior and interior firefighting. NFPA 24 indicates two hose streams for every part of the interior of each building not covered by standpipe protection and a single hose stream to protect the exterior of buildings with interior standpipe systems. Both requirements specify that there shall be sufficient hydrants to concentrate the required fire flow about any important building with no hose line exceeding 500 feet in length. Appendix A to BTP 9-5.1, indicates that "*Outside manual hose installation should be sufficient to reach any location with an effective hose stream. To accomplish this, hydrants should be installed approximately every 250 feet on the yard main system*". This approximate distance is recommended, but may not be necessary, in order to accomplish this intent of this requirement.

A review of plant drawings and plant walkdowns has confirmed that there is a sufficient number and locations of yard fire hydrants such that two hose streams with hose lengths of 500 feet or less (from single or multiple hydrants) can reach the interior buildings not provided with interior standpipe systems. The remaining buildings are provided with a sufficient number of Class II standpipes located throughout the structure to enable the fire brigade to reach all areas of the plant by an interior hose stream. The review of plant drawings and plant walkdowns has also confirmed that there is a sufficient number and location of yard fire hydrants such that a hose stream with hose lengths of 500 feet or less can reach the exterior of each of these buildings.

Acceptance Criteria Evaluation:

Nuclear Safety and Radiological Release Performance Criteria:
The current spacing of yard fire hydrants meets the intent of NFPA 24-1973 and is considered to provide a functional equivalency to the approximate spacing specified in the codes. The current layout of yard fire hydrants would therefore not impact nuclear safety. The fire hydrants are located on the yard main and would not impact radiological release performance criteria.

Safety Margin and Defense-in-Depth:
The margin of safety that is inherent within the NFPA 805 Fire PRA and performance based review is acceptable to ensure that no conditions are inadvertently produced that would challenge the ability of the fire protection features individually and or combined as defense-in-depth. There would be no effect on active fire suppression activities and would be within the limitations and assumptions of the Fire PRA.

Conclusion:
VCSNS determined that the Fire Protection Program engineering and administrative features and controls provide a level of risk management and performance that achieves the following criteria:

- Satisfies the performance goals performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;
- Maintains safety margins; and
- Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

Approval Request L9

NFPA 805 Section: 3.6.2 Hose Stations

Request: Clarification and approval is requested for existing standpipe systems that provide adequate water flow rates and nozzle pressure and do not utilize pressure reducers. This is based on system calculations and the proper hose line training, fire brigade member capabilities and off-site fire department member training with hoses under high pressure conditions.

Basis for Request: Training on high pressure lines addresses safety considerations indicated by this section of the NFPA Code. In general, higher pressures at hose stations and at standpipe or hydrant connections support addressing B.5.B mitigation scenarios, as required by 10 CFR 50.54(hh), and adequate flow and pressure for these hose stations and exterior hose houses.

Acceptance Criteria Evaluation:

Nuclear Safety and Radiological Release Performance Criteria:
The ability of the hose stations would not impact a nuclear safety or create a radiological concern from utilizing an alternate approach that is effective in delivering required water supply for structures and fire-fighting through proper training which is a performance based approach.

Safety Margin and Defense-in-Depth:
The margin of safety that is inherent within the NFPA 805 Fire PRA and performance based review and is acceptable to ensure that no conditions are inadvertently produced that would challenge the ability of the fire protection features individually and or combined as defense-in-depth. There would be no effect on active fire suppression activities and would be within the limitations and assumptions of the Fire PRA.

Conclusion:
VCSNS determined that the Fire Protection Program engineering and administrative features and controls provide a level of risk management and performance that achieves the following criteria:

- Satisfies the performance goals performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;
- Maintains safety margins; and
- Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

Approval Request L10

NFPA 805 Section: 3.6.4 Class III/ Seismic Analyzed Hose Stations

Request: Approval is requested for the design attributes concerning the existing installation of the Class II Hose Station and Standpipe System.

Basis for Request: The standpipe system and hose stations were designed in accordance with the NRC requirements and NFPA codes applicable at the time of the system design (NFPA 14, 1974 edition). The standpipe and hose stations were designed as Class II systems utilizing 1-1/2-inch hose connections. NFPA14-1974 provides the requirements for the design attributes of the varied classes of standpipe systems, but does not specify what class of system is required. The selection of the Class II standpipe design was based on good engineering practices and insurance guidelines in effect at the time of design and installation.

The existing Class II system design provides an acceptable means for providing manual fire suppression to safety related and important to safety areas within the plant. The system has been designed to deliver the flow and pressure requirements of NFPA14-1974. The Class II system also has the capability of furnishing the effective streams during the more advanced stages of fire on the inside of the building as well as providing a ready means for the control of fire by the occupants of the building, per NFPA 14. In addition, based on plant construction attributes, occupancy, and other fire protection features that would provide for early detection and suppression, the larger hose streams provided by a Class III design would not normally be needed and would not significantly increase the level of fire protection provided at VCSNS.

The NRC did not endorse the Section 3.6.4 exception concerning stations that did not meet the SSE requirement (Reference 10 CFR 50.48(c), subsection (2)(vi)). The exception allowed for plants to have alternate measures / provisions to restore a water supply and distribution system for manual fire-fighting purposes. The provisions for establishing this provisional system shall be preplanned and be capable of being implemented in a timely manner following an SSE.

VCSNS has alternate provisions and strategies for the loss of fire suppression preplanned in accordance with our Operating License Condition 2.C(34) Mitigation Strategy License Condition. These measures and guidelines may be implemented as necessary to restore the fire service water supply and distribution system following an SSE. Plant procedure EPP-027, Hostile Actions, (Reference 9.9) establishes guidance for the response to hostile actions against the plant including the restoration of fire service piping.

Acceptance Criteria Evaluation:

Nuclear Safety and Radiological Release Performance Criteria:
The use of Class II hose stations in lieu of Class III hose stations, which are not seismically designed, would not impact nuclear safety. The utilization of the Class II hose stations and preplanned alternate provisions and strategies for the loss of fire suppression following a SSE would not impact radiological release criteria.

Safety Margin and Defense-in-Depth:
The margin of safety that is inherent within the NFPA 805 Fire PRA and performance based review is acceptable to ensure that no conditions are inadvertently produced that would challenge the ability of the fire protection features individually and or combined as defense-in-depth. There would be no effect on active fire suppression activities and would be within the limitations and assumptions of the Fire PRA.

Conclusion:
VCSNS determined that the Fire Protection Program engineering and administrative features and controls provide a level of risk management and performance that achieves the following criteria:

- Satisfies the performance goals performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;
- Maintains safety margins; and
- Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

Approval Request L11

NFPA 805 Section: 3.8.2 Detection

Request: Approval is requested for the existing layout and placement of fire detection devices that are in accordance with NFPA 72E-1978 code of record. The detection system scope when panels were upgraded did not include the relocation or re-design of detection devices to NFPA 72. The automatic fire detection meets the performance requirements of the Listed devices installed in accordance with NFPA 72, National Fire Alarm Code, and its applicable appendixes except for the detector spacing which is in accordance with the NFPA 72E-1978, which is the code of record and an equivalent approach.

Basis for Request: The fire alarm and detection system was upgraded in accordance with NFPA 72. Fire detection device layout was conducted in accordance with NFPA 72E and has been documented in a design calculation as a controlled document. Revisions and or minor changes to these NFPA 72E requirements would be evaluated and addressed in the design review process.

Acceptance Criteria Evaluation:

Nuclear Safety and Radiological Release Performance Criteria:
The performance of the detection devices being located per this code of record and not an alternate code would not impact a nuclear safety or create a radiological concern. The effectiveness of detection devices is developed through a performance based approach based on industry data and actual fire tests and would not impacts nuclear safety or radiological releases.

Safety Margin and Defense-in-Depth:
The margin of safety that is inherent within the NFPA 805 Fire PRA and performance based review and is acceptable to ensure that no conditions are inadvertently produced that would challenge the ability of the fire protection features individually and or combined as defense-in-depth. There would be no effect on active fire suppression or detection activities and would be within the limitations and assumptions of the Fire PRA.

Conclusion:
VCSNS determined that the Fire Protection Program engineering and administrative features and controls provide a level of risk management and performance that achieves the following criteria:

- Satisfies the performance goals performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;
- Maintains safety margins; and
- Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

M. License Condition Changes

4 Pages Attached

Replace the current VCSNS fire protection license condition 2.c (18) with the standard license condition in Regulatory Position 3.1 of RG 1.205, Revision 1, modified as shown below. In support of this change, VCSNS has developed a Fire Probabilistic Risk Assessment (Fire PRA) during the course of its observation of VCSNS's transition to NFPA 805. Outstanding high level findings from the Fire PRA Peer review are included in Attachment V.

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South Carolina Electric & Gas Company shall implement and maintain in effect all provisions of the approved fire protection program that comply with 10 CFR 50.48(a) and 10 CFR 50.48(c), as specified in the licensee amendment request dated November 15, 2011 and as approved in the safety evaluation report dated __________. Except where NRC approval for changes or deviations is required by 10 CFR 50.48(c), and provided no other regulation, technical specification, license condition or requirement would require prior NRC approval, the licensee may make changes to the fire protection program without prior approval of the Commission if those changes satisfy the provisions set forth in 10 CFR 50.48(a) and 10 CFR 50.48(c), the change does not require a change to a technical specification or a license condition, and the criteria listed below are satisfied.

Risk-Informed Changes that May Be Made Without Prior NRC Approval

A risk assessment of the change must demonstrate that the acceptance criteria below are met. The risk assessment approach, methods, and data shall be acceptable to the NRC and shall be appropriate for the nature and scope of the change being evaluated; be based on the as-built, as-operated, and maintained plant; and reflect the operating experience at the plant. Acceptable methods to assess the risk of the change may include methods that have been used in the peer-reviewed fire PRA model, methods that have been approved by NRC through a plant-specific license amendment or NRC approval of generic methods specifically for use in NFPA 805 risk assessments, or methods that have been demonstrated to bound the risk impact.

a. Prior NRC review and approval is not required for changes that clearly result in a decrease in risk. The proposed change must also be consistent with the defense-in-depth philosophy and must maintain sufficient safety margins. The change may be implemented following completion of the plant change evaluation.

b. Prior NRC review and approval is not required for individual changes that result in a risk increase less than 1×10^{-7}/year (yr) for CDF and less than 1×10^{-8}/yr for LERF. The proposed change must also be consistent with the defense-in-depth philosophy and must maintain sufficient safety margins. The change may be implemented following completion of the plant change evaluation.

Other Changes that May Be Made Without Prior NRC Approval

(1) Changes to NFPA 805, Chapter 3, Fundamental Fire Protection Program

Prior NRC review and approval are not required for changes to the NFPA 805, Chapter 3, fundamental fire protection program elements and design requirements for which an engineering evaluation demonstrates that the alternative to the Chapter 3 element is functionally equivalent or adequate for the hazard. The licensee may use an engineering evaluation to demonstrate that a change to NFPA 805, Chapter 3, element is functionally equivalent to the corresponding technical requirement. A qualified fire protection engineer shall approve the engineering evaluation and conclude that the change has not affected the functionality of the component, system, procedure, or physical arrangement, using a relevant technical requirement or standard.

The licensee may use an engineering evaluation to demonstrate that changes to certain NFPA 805, Chapter 3, elements are acceptable because the alternative is "adequate for the hazard." Prior NRC review and approval would not be required for alternatives to four specific sections of NFPA 805, Chapter 3, for which an engineering evaluation demonstrates that the alternative to the Chapter 3 element is adequate for the hazard. A qualified fire protection engineer shall approve the engineering evaluation and conclude that the change has not affected the functionality of the component, system, procedure, or physical arrangement, using a relevant technical requirement or standard. The four specific sections of NFPA 805, Chapter 3, are as follows:

- Fire Alarm and Detection Systems (Section 3.8);
- Automatic and Manual Water-Based Fire Suppression Systems (Section 3.9);
- Gaseous Fire Suppression Systems (Section 3.10); and,
- Passive Fire Protection Features (Section 3.11).

(2) Fire Protection Program Changes that Have No More than Minimal Risk Impact

Prior NRC review and approval are not required for changes to the licensee's fire protection program that have been demonstrated to have no more than a minimal risk impact. The licensee may use its screening process as approved in the NRC safety evaluation dated ____________________. The licensee shall ensure that fire protection defense-in-depth and safety margins are maintained when changes are made to the fire protection program.

Transition License Conditions

(1) Before achieving full compliance with 10 CFR 50.48(c), as specified by (2) below, risk-informed changes to the licensee's fire protection program may not be made without prior NRC review and approval unless the change has been demonstrated to have no more than a minimal risk impact, as described in (2) above.

(2) The licensee shall implement the following modifications to its facility to complete the transition to full compliance with 10 CFR 50.48(c) by December 31, 2015:

- ECR50577: NFPA 805 Instrument Air Recovery
- ECR50780: Alternate Seal Injection (MSPI)
- ECR50784: NFPA 805 Circuit/ Tubing Protection
- ECR50799: NFPA 805 RCP Seal Replacement
- ECR50800: NFPA 805 1DA 115kV Supply Reroute
- ECR50810: NFPA 805 Hazard Protection
- ECR50811: NFPA 805 Incipient Detection
- ECR50812: NFPA 805 Disconnect Switch Rework
- ECR70588: NFPA 805 Penetration Seal Documentation
- ECR71553: NFPA 805 Communication

(3) The licensee shall maintain appropriate compensatory measures in place until completion of the modifications delineated above.

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License condition 2.c (18) shall be superseded upon full implementation of the NFPA 805 license condition:

Fire Protection System (Section 9.5.1. SSER 4)

Virgil C. Summer Nuclear Station shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report for the facility, and as approved in the Safety Evaluation Report (SER) dated February 1981 (and Supplements dated January 1982 and August 1982) and Safety Evaluations dated May 22, 1986, November 26, 1986, and July 27, 1987subject to the following provisions:

The licensee may make changes to the approved fire protection program without prior approval of theCommission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of fire.

No other license conditions need to be revised or superseded.

VCSNS implemented the following process for determining that these are the only license conditions required to be either revised or superseded to implement the new FPP which meets the requirements in 10 CFR 50.48(a) and 50.48(c):

A review was conducted of the VCSNS Facility Operating License NPF-12, by VCSNS licensing staff and NFPA 805 Transition Team. The review was performed by reading the Operating License and performing electronic searches. In addition, outstanding LARs that have been submitted to the NRC were also reviewed for potential impact on the license conditions.

Refer to Enclosure 3 for the proposed VCSNS Facility Operating License NPF-12 markups and retyped pages.

N. Technical Specification Changes

2 Pages Attached

Delete the following Technical Specification:

Section 6.8.1 Written procedures shall be established, implemented, and maintained covering the activities referenced below:

f. Fire Protection Program

No other Technical Specifications need to be revised or deleted.

VCSNS implemented the following process for determining that these are the only Technical Specifications required to be revised or deleted to implement the new FPP which meets the requirements in 10 CFR 50.48(a) and 50.48(c).

- A review was conducted of the VCSNS Technical Specifications, by VCSNS licensing and NFPA 805 Transition Team. The review was performed by reading the Technical Specifications and performing electronic searches. Outstanding Technical Specification changes that have been submitted to the NRC were also reviewed for potential impact on the license conditions.

VCSNS determined that these changes to the Technical Specifications are adequate for adoption of the new fire protection licensing basis, for the following reasons:

- The requirement for establishing, implementing, and maintaining FP procedures is contained in the regulation (10 CFR 50.48(a) and 50.48(c) NFPA 805 Chapter 3).
- 10 CFR 50.48(b) Appendix R requirements will be superseded by 10 CFR 50.48(a) and 50.48(c).

Refer to Enclosure 3 for the proposed VCSNS Technical Specification markups and retyped pages.

O. Orders and Exemptions

2 Pages Attached

Exemptions

VCSNS was licensed to operate after January 1, 1979 and therefore licensing actions associated with 10 CFR 50 Appendix R were not issued as exemptions to the regulation. Therefore no exemptions need to be rescinded.

Orders

No Orders need to be superseded or revised.

VCSNS implemented the following process for making this determination:

- A review was conducted of VCSNS docketed correspondence by VCSNS licensing staff. The review was performed by reviewing the correspondence files and performing electronic searches of internal VCSNS records and the NRC's ADAMS document system.

A specific review was performed of the license amendment that incorporated the mitigation strategies required by Section B.5.b of Commission Order EA-02-026 (TAC No. MD4602) to ensure that any changes being made to ensure compliance with 10 CFR 50.48(c) do not invalidate existing commitments applicable to the plant. The review of this order demonstrated that changes to the FPP will not affect measures required by B.5.b.

P. RI-PB Alternatives to NFPA 805 10 CFR 50.48(c)(4)

1 Page Attached

No risk-informed or performance-based alternatives to compliance with NFPA 805 (per 10 CFR 50.48(c)(4)) were utilized by VCSNS.

Q. No Significant Hazards Evaluations

4 Pages Attached

No Significant Hazard Consideration

Pursuant to 10 CFR 50.91, SCE&G has made the determination that this amendment request involves a "No Significant Hazards Consideration" by applying the standards established by the NRC regulations in 10 CFR 50.92.This amendment does not involve a significant hazards consideration for the following reasons:

To the extent that these conclusions apply to compliance with the requirements in NFPA 805, these conclusions are based on the following NRC statements in the Statements of Consideration accompanying the adoption of alternative fire protection requirements based on NFPA 805.

1) **Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?**

Response: No.

Operation of VCSNS in accordance with the proposed amendment does not increase the probability or consequences of accidents previously evaluated. The Final Safety Analysis Report (FSAR) documents the analyses of design basis accidents (DBA) at VCSNS. The applicable accident associated with this license amendment request (LAR) is a fire. The proposed amendment does not adversely affect accident initiators nor alter design assumptions, conditions, or configurations of the facility and does not adversely affect the ability of structures, systems, and components (SSCs) to perform their design function. SSCs required to safely shut down the reactor and to maintain it in an Appendix R safe shutdown (SSD) condition will remain capable of performing their design functions.

The purpose of this amendment is to permit VCSNS to adopt a new fire protection (FP) licensing basis which complies with the requirements in 10 CFR 50.48(a) and (c) and the guidance in Revision 1 of Regulatory Guide (RG) 1.205. The NRC considers that National Fire Protection Association (NFPA) 805 provides an acceptable methodology and performance criteria for licensees to identify FP systems and features that are an acceptable alternative to the Appendix R FP features (69 FR 33536, June 16, 2004). Engineering analyses, which may include engineering evaluations, probabilistic safety assessments, and fire modeling calculations, have been performed to demonstrate that the risk-informed, performance-based (RI-PB) requirements per NFPA 805 have been met.

NFPA 805, taken as a whole, provides an acceptable alternative to 10 CFR 50.48(b) and satisfies 10 CFR 50.48(a) and General Design Criterion (GDC) 3 of Appendix A to 10 CFR Part 50 and meets the underlying intent of the NRC's existing FP regulations and guidance, and achieves defense-in-depth (DID) and the goals, performance objectives, and performance criteria specified in Chapter 1 of the standard and, if there are any increases in core damage frequency (CDF) or risk, the increase will be small and consistent with the intent of the Commission's Safety Goal Policy.

Based on this, the implementation of this amendment does not significantly increase the probability of any accident previously evaluated. Equipment required to mitigate an accident remains capable of performing the assumed function. Therefore, the consequences of any accident previously evaluated are not significantly increased with the implementation of this amendment.

2) **Does the proposed amendment create the possibility of a new or different kind of accident from any kind of accident previously evaluated?**

Response: No.

Operation of VCSNS in accordance with the proposed amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated. Any scenario or previously analyzed accident with offsite dose was included in the evaluation of DBAs documented in the FSAR. The proposed change does not alter the requirements or function for systems required during accident conditions. Implementation of the new FP licensing basis which complies with the requirements in 10 CFR 50.48(a) and (c) and the guidance in Revision 1 of RG 1.205 will not result in new or different accidents.

The proposed amendment does not adversely affect accident initiators nor alter design assumptions, conditions, or configurations of the facility. The proposed amendment does not adversely affect the ability of SSCs to perform their design function. SSCs required to safely shut down the reactor and maintain it in a safe shutdown condition remain capable of performing their design functions.

The purpose of this amendment is to permit VCSNS to adopt a new FP licensing basis which complies with the requirements in 10 CFR 50.48(a) and (c) and the guidance in Revision 1 of RG 1.205. The NRC considers that NFPA 805 provides an acceptable methodology and performance criteria for licensees to identify FP systems and features that are an acceptable alternative to the Appendix R FP features (69 FR 33536, June 16, 2004).

The requirements in NFPA 805 address only FP and the impacts of fire on the plant have already been evaluated. Based on this, the implementation of this amendment does not create the possibility of a new or different kind of accident from any kind of accident previously evaluated. The proposed changes do not involve new failure mechanisms or malfunctions that can initiate a new accident. Therefore, the possibility of a new or different kind of accident from any kind of accident previously evaluated is not created with the implementation of this amendment.

3) **Does the proposed amendment involve a significant reduction in the margin of safety?**

Response: No.

Operation of VCSNS in accordance with the proposed amendment does not involve a significant reduction in the margin of safety. The proposed amendment does not alter the manner in which safety limits, limiting safety system settings or limiting conditions for operation are determined. The safety analysis acceptance criteria are not affected by this change. The proposed amendment does not adversely affect existing plant safety margins or the reliability of equipment assumed to mitigate accidents in the UFSAR. The proposed amendment does not adversely affect the ability of SSCs to perform their design function. SSCs required to safely shut down the reactor and to maintain it in a safe shutdown condition remain capable of performing their design functions.

The purpose of this amendment is to permit VCSNS to adopt a new FP licensing basis which complies with the requirements in 10 CFR 50.48(a) and (c) and the guidance in Revision 1 of RG 1.205. The NRC considers that NFPA 805 provides an acceptable methodology and performance criteria for licensees to identify FP systems and features that are an acceptable alternative to the Appendix R FP features (69 FR 33536, June 16, 2004). Engineering analyses, which may include engineering evaluations, probabilistic safety assessments, and fire modeling calculations, have been performed to demonstrate that the performance-based methods do not result in a significant reduction in the margin of safety.

Based on this, the implementation of this amendment does not significantly reduce the margin of safety. The proposed changes are evaluated to ensure that risk and safety margins are kept within acceptable limits. Therefore, the transition does not involve a significant reduction in the margin of safety.

NFPA 805 continues to protect public health and safety and the common defense and security because the overall approach of NFPA 805 is consistent with the key principles for evaluating license basis changes, as described in RG 1.174, is consistent with the defense-in-depth philosophy, and maintains sufficient safety margins.

Margins previously established for the VCSNS FP program in accordance with 10 CFR 50.48(b) and Appendix R to 10 CFR 50 are not significantly reduced. Therefore, this LAR does not result in a reduction in a margin of safety.

R. Environmental Considerations Evaluation

2 Pages Attached

Environmental Consideration

SCE&G has evaluated this LAR against the criteria for identification of licensing and regulatory actions requiring environmental assessment in accordance with 10 CFR 51.21. SCE&G has determined that this LAR meets the criteria for a categorical exclusion set forth in 10 CFR 51.22(c)(9). This determination is based on the fact that this change is being proposed as an amendment to a license issued pursuant to 10 CFR 50.

The purpose of this amendment is to permit VCSNS to adopt a new fire protection licensing basis which complies with the requirements in 10 CFR 50.48(a) and (c) and the guidance in Revision 1 of RG 1.205. The NRC considers that NFPA 805 provides an acceptable methodology and performance criteria for licensees to identify FP requirements that are an acceptable alternative to the Appendix R fire protection features (69 FR 33536, June 16, 2004).

The requirements in NFPA 805 address only fire protection and the impacts of fire on the plant have already been evaluated, as part of compliance to 10 CFR 50.48(a) and (b).

This amendment meets the following specific criteria:

i. As stated in Section 5.3.1 of the Transition Report, this proposed amendment does not involve significant hazards consideration.

ii. There are no significant changes in the types or significant increase in the amounts of any effluent that may be released offsite.

   Transition to the NFPA 805 FP requirements does not impact effluents. Therefore, there will be no significant change in the types or significant increase in the amounts of any effluents released offsite.

iii. There is no significant increase in individual or cumulative occupational radiation exposure.

   Compliance with NFPA 805 requirements concerning radioactive release due to suppression effects during a fire is documented in Attachment E. There will be no significant increase in individual or cumulative occupational radiation exposure resulting from this change.

Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in conjunction with the proposed amendment.

S. Plant Modifications and Items to be Completed During Implementation

7 Pages Attached

Table S-1, Plant Modifications Committed, provided below includes a description of the modifications, along with the following information:

- Item ECR number,
- Risk ranking of the modification,
- Location of the modification,
- Problem statement,
- Proposed change,
- An indication if the modification is currently included in the Fire PRA,
- Compensatory Measure in place,
- A risk-informed characterization of the modification and compensatory measure, and
- The modification completion date.

Table S-1 Plant Modifications Committed

Item	Rank	Location	Problem Statement	Proposed Change	In Fire PRA	Comp Measure	Risk Informed Characterization	Completion
ECR50577: NFPA 805 Instrument Air Recovery	Low	Yard	Operator manual action required to start Diesel Driven Air Compressor (Eliminate OMA).	Provide auto start capability for the Diesel Driven Air Compressor (XAC0014).	Yes	CLB/ FEP	Instrument air importance in the internal events model is associated with Steam Generator Tube Rupture. It is not as important for fire scenarios.	2012
ECR50780: Alternate Seal Injection (MSPI)	High	AB	Improvement in station equipment to address Loss of Seal Cooling/ LOCA scenarios for RCP Seals.	Provide addition high pressure pump/ Diesel Generator to mitigate loss of RCP seal cooling (NFPA 805 Credit).	Yes	None	A sensitivity study for the fire PRA showed that this modification was highly important.	2013
ECR50784: NFPA 805 Circuit/ Tubing Protection	Low	As Defined	Additional insights gained during performance of NFPA 805 analysis defining circuit and equipment interactions.	Provide protection of tubing/ circuits from the effects of fire.	Yes	Yes	Instrument air importance in the internal events model is associated with Steam Generator Tube Rupture. It is not as important for fire scenarios.	2015

Table S-1 Plant Modifications Committed

Item	Rank	Location	Problem Statement	Proposed Change	In Fire PRA	Comp Measure	Risk Informed Characterization	Completion
ECR50799: NFPA 805 RCP Seal Replacement	Medium	RB412	Improvement in station equipment to address Loss of Seal Cooling/ LOCA scenarios for RCP Seals.	Provide lower leakage RCP Seals [Outage].	Yes	None	Alternate Seal Injection obviates much of the benefit of this modification. This would be ranked "High" if not for Alternate Seal Injection.	2015
ECR50800: NFPA 805 1DA 115kV Supply Reroute	High	TB436	Address vulnerability of loss of the 230kV and 115kV feed from 1DX to 1DA and 1DB (ESF Busses) due to a single TB fire.	Reroute 115kV Feed to ESF bus 1DA (Risk) [Outage].	Yes	CLB/ FEP	A sensitivity study for the fire PRA showed that this modification was highly important.	2015
ECR50810: NFPA 805 Hazard Protection	High	As Defined	Fire protection feature enhancements.	Provide mitigation strategies to address fire initiators or limit fire propagation.	Yes	Yes	A sensitivity study for the fire PRA showed that this modification was highly important.	2015
ECR50811: NFPA 805 Incipient Detection	High	CB	Improve early indications of fire precursors in key risk significant areas of the plant.	Provide Incipient Detection System at the top of selected electrical panels in the Relay and Upper Cable Spreading Rooms.	Yes	None	A sensitivity study for the fire PRA showed that this modification was highly important.	2013
ECR50812: NFPA 805 Disconnect Switch Rework	High	CB	Disconnect switches could not mitigate spurious operation for all potential circuit failure conditions.	Protect or reroute the disconnect switch cables.	Yes	Yes	The PRA showed that spurious operation of these components was a significant risk contributor.	2015
ECR70588: NFPA 805 Penetration Seal Documentation	Low	Various	Improve documentation of penetration seal designs to penetration tests.	Document updates to include improved penetration details and alignment with vendor tests.	Yes	None	Integrity of fire barriers is maintained by the quality of penetration seal installations vs. fire test configurations (important to fire scenario development).	2014

Item	Rank	Location	Problem Statement	Proposed Change	In Fire PRA	Comp Measure	Risk Informed Characterization	Completion
ECR71553: NFPA 805 Communication	Medium	As Defined	Improve availability and reliability of station communication system(s) during fire scenarios.	Provide alternate backup, protected communication system to support fire event.	No	None	Communication is implicitly considered in credit for Fire PRA operator actions. However, many are performed in the control room where communication is not threatened by fire.	2013

Table S-1 Plant Modifications Committed

Note: ECR70588 is not a plant modification. This ECR was added to Table S-1 to emphasize the importance and size of the scope.

Table S-2, Implementation Items, provided below includes those items (procedure changes, process updates, and training to affected plant personnel) that will be completed prior to the implementation of new NFPA 805 fire protection program. This will occur one hundred eighty (180) days after NRC approval.

Table S-2 Implementation Items

Item No.	Primary NFPA 805 Code Section	Description	LAR Section / Source	Corrective Action
1	3.2 FP Plan	Table B-1 Open Items – Revise Fire Protection Program Administrative procedures (e.g. FP Program Plan, Transient Material Control, Compensatory Measures) as needed for implementation of NFPA 805 Program as defined in Attachment A.	4.1.2 and Attachment A	CR11-03925/01
2	3.2.3 Procedures	Table B-1 Open Items – Revise Fire Protection Preventive Maintenance and Surveillance procedures to improve alignment to scope and frequencies associated with NFPA Code requirements as defined in Attachment A and NFPA Code of Record Document.	4.1.2 and Attachment A	CR11-03925/02
3	3.3 Prevention	Table B-1 Open Items – Revise Fire Protection Program Technical procedures (e.g. Electrical Cable, Insulation Materials, Interior Finishes) as needed for implementation of NFPA 805 Program as defined in Attachment A.	4.1.2 and Attachment A	CR11-03925/03
4	2.6 Monitoring	Table B-1 – Enhance VCSNS Condition Monitoring Program to include NFPA 805 elements. (NFPA 805 Sections 3.2.3(3), 2.6)	4.1.2 and Attachment A	CR11-03925/04
5	3.4.2 Pre-Fire Plans & 4.3 Radiation Release	Table B-1 – Update Fire Pre Plans to include NFPA 805 elements, Fire PRA and Radiological Release elements. (NFPA 805 Section 3.4.2)	4.1.2 / 4.4.2 and Attachment A/E	CR11-03925/05
6	3.4 Industrial Fire Brigade	Table B-1 – Enhance VCSNS Fire Brigade Member qualification to include NFPA 805 elements. (NFPA 805 Section 3.4.1)	4.1.2 and Attachment A	CR11-03925/06
7	3.4.3 Training and Drills	Table B-1 – Enhance VCSNS Emergency Response training program to include NFPA 805 elements. (NFPA 805 Sections 3.4.3, 3.4.4 and 3.4.5)	4.1.2 / 4.4.2 and Attachment A/E	CR11-03925/07

Table S-2 Implementation Items

Item No.	Primary NFPA 805 Code Section	Description	LAR Section / Source	Corrective Action
8	3.4.6 Communications	Table B-1 – Complete communications study and define strategies to ensure viable communications exists to support the fire brigade and other plant personnel during the course of a fire emergency. (NFPA 805 Section 3.4.6)	4.1.2 and Attachment A/G	CR11-03925/08
10	3.8.2 Detection	Table B-1 – Rework any smoke detectors found to not in compliance with NFPA 72E. (NFPA 805 Section 3.8.2)	4.1.2 and Attachment A	CR11-03925/10
11	3.8.2 Detection & 3.11 Passive FP Features	Table B-1/ B-3 – Update Surveillance procedures for "Required" Fire Barriers and ERFBS defined in the NSCA and Fire PRA. (NFPA 805 Sections 3.8.2 and 3.11)	4.1.2 and Attachment A/C	CR11-03925/11
12	3.11 Passive FP Features	Table B-1 – Update Station Fire Barrier Penetration sealing details to improve alignment with test protocols acceptable to the Authority Having Jurisdiction. (NFPA 805 Sections 3.11)	4.1.2 and Attachment A	CR11-03925/12
13	2.7.2 Configuration Control & 3.2.3 Procedures	NFPA 805 – Complete update to Engineering and Fire PRA procedures to manage configuration control of NFPA 805 Analysis documents. (NFPA 805 Section 2.7.2)	4.7 and Attachment B	CR11-03925/13
14	2.7.2 Configuration Control & 3.2.3 Procedures	NFPA 805 – Complete update to Engineering and Fire PRA procedures to manage configuration control of NFPA 805 Analysis documents. (NFPA 805 Section 2.7.2)	4.7 and Attachment B	CR11-03925/14
15	1.4 Performance Objectives & 3.4.2 Pre-Fire Plans	TR08620-312 – Update of station operating procedures, including the conducting associated training (which are not modification related) to incorporate insights and the change in operational shutdown strategy in response to a fire at the station.	4.2.4 and Attachment C	CR11-03925/15
16	1.4 Performance Objectives & 3.3.1 FP Operational Activities	TR07800-008 – Completion of Administrative procedures and documents to support the implementation of the non-power modes of plant operating states for implementation of NFPA 805.	4.3.2 and Attachment D	CR11-03925/16
17	2.7.3.4 Qualification of Users & 3.2.1 Intent	NFPA 805 – Complete the identification of Training qualifications including the training of technical personnel responsible for update and maintenance of the NFPA 805 Analysis. (NFPA 805 Section 2.7.3.4)	2.7.3.4 and 4.7.2	CR11-03925/17

Table S-2 Implementation Items

Item No.	Primary NFPA 805 Code Section	Description	LAR Section / Source	Corrective Action
18	2.7.1.2 FPP Design Basis Documents & 3.2.3 Procedures	NFPA 805 – Complete the development and issuance of the Fire Safety Analysis (FSA) to summarize area results and insights from the NFPA 805 Analysis. (NFPA 805 Section 2.7.1.2)	4.7.1	CR11-03925/18
19	3.4.4 Fire Brigade Equipment	Table B-1 – Improve controls on procurement of FP Equipment to ensure consistency with NFPA Standards	4.1.2 and Attachment A	CR11-03925/19
20	2.7.2 Configuration Control & 3.2.3 Procedures	Resolve (including timing) for 8 hour Emergency Lighting with the elimination of Operator Manual Actions [except for Control Room Evacuation]		CR11-03925/20

Note: Changes to station procedures and Training associated with station hardware modifications (Table S-1) normally coincide with scheduled turnover of the equipment to the VCSNS Operation's organization, and are not included in the above table.

T. Clarification of Prior NRC Approvals

1 Page Attached

There are no elements of the pre-transition fire protection program licensing basis that require clarification of prior NRC approval.

U. Internal Events PRA Quality

21 Pages Attached

In accordance with RG 1.205 Regulatory Position 4.3:

"The licensee should submit the documentation described in Section 4.2 of Regulatory Guide 1.200 to address the baseline PRA and application-specific analyses. For PRA Standard "supporting requirements" important to the NFPA 805 risk assessments, the NRC position is that Capability Category II is generally acceptable. Licensees should justify use of Capability Category I for specific supporting requirements in their NFPA 805 risk assessments, if they contend that it is adequate for the application. Licensees should also evaluate whether portions of the PRA need to meet Capability Category III, as described in the PRA Standard."

An evaluation documenting the review of the findings from the VCSNS WOG Peer Review and 2005 and 2007 Regulatory Guide 1.200 Gap Assessments for impact on Fire PRA model development was performed and documented in Assessment Number SA-09-NL-02, "Fire PRA Standards Compliance Assessment."

The results of the review show that the resolutions of findings from the WOG Peer Review and Regulatory Guide 1.200 Gap Assessments do not impact the development of a Fire PRA. No items were found that would disqualify the VCSNS Internal Events PRA Model from being the basis for developing the Fire PRA. No dispositions from the Peer Review of Gap Analyses would need to be different for use in the Fire PRA. As a result, the VCSNS Internal Events PRA Model (including resolution of findings from reviews and assessments) is an acceptable starting point for Fire PRA development.

The F&Os are shown below.

Table U-1 discusses each of the WOG Peer Review, A and B Level F&Os.

Table U-2 discusses each of the Reg. Guide 1.200 Gap Assessment (April 2005 and November 2007) F&Os.

Table U-1 Internal Events PRA Peer Review (WOG Peer Review) – A and B Level Findings and Observations

SR	Status	Finding/Observation	Disposition
IE-03	Resolved	Spurious PSV and Spurious PORV Openings do not appear to be treated in the model. The NUREG/CR-5750 value for small break LOCAs as presented in calculation CN-RRA-02-32 is for pipe breaks only. The IPE Initiating Events Frequency Notebook includes a discussion of these potential initiators which was marked to indicate that these were to be treated as consequential LOCAs. A spurious opening and a failure to reseat following a transient induced challenge are not the same thing. The spurious openings need to be treated as a source of a small LOCA initiator.	Spurious Pressurizer Safety Valve opening and spurious Pressurizer PORV opening were added to the VCSNS PRA as a result of this comment. Addition of these new initiating events does not adversely impact the development of the Fire PRA. In fact, per Generic WOG MSO 17, spurious opening of multiple Pressurizer PORVs is to be addressed in the Fire PRA model.
IE-06	Resolved	There were two issues identified with the ISLOCA initiating event frequency derivation. The first issue is in quantification of the V-sequence frequency and any other cutsets whose frequency is proportional to XN, where X is a failure rate and N is a number of independent events in the cutset having the same failure rate, the mean frequency is not equal to the Nth power of the mean failure rate. For N=2 and the case where X is lognormally distributed, X2 = M2 + V, where M is the mean failure rate and V is the variance of the lognormal distribution. The problem is more complicated with N>2. When dealing with the V-sequence the failure rates are very low and the variance is very high such that the variance term dominates. When this is taken into account the Mean V-sequence frequency can easily be an order of magnitude greater than the result obtained using a mean point estimate (M2). It is not clear that this has been taken into account in the V-sequence quantification. The second issue is the need to consider a range of normally closed valve failure modes such that not only severe ruptures but large leaks that exceed the relieving capacity of low pressure side relief valves whose failure rates may be significantly higher than the gross rupture failure rates. Other PWR ISLOCA analyses (Seabrook and Watts Bar PRAs, for example) have found such failure modes to be more important than gross rupture failure modes. It is not clear that these failure modes or the relief valve capacities have been taken into account in the ISLOCA analysis.	The ISLOCA initiating event frequency calculation was updated to account for the Mean V-sequence frequency and independent events larger than two affect. Additionally, large leaks and their impacts are now modeled. The frequency calculation method utilized does not impact the development of a Fire PRA.
AS-01	Resolved	The success criteria for successfully mitigating an ISLOCA (due to pipe break) are questionable and inadequately justified. The model assumes that ISLOCAs do not result in CD or LER if there is successful HPI, HPR and depressurization with long term makeup to the primary from an	To resolve this issue, large pipe breaks were added to the ISLOCA analysis. All large LOCAs (particularly RHR line ISLOCAs) are now modeled directly to core damage. This rework of the ISLOCA analysis applies equally to Fire PRA as to internal

Table U-1 Internal Events PRA Peer Review (WOG Peer Review) – A and B Level Findings and Observations

SR	Status	Finding/Observation	Disposition
		external source. The assumption that LP pipes would not rupture viz-a-viz a probabilistic treatment of LP pressure boundary components is questionable. There is inadequate documentation to support the assumption that LP pipes would not break. Also the assumption that non-pipe failure modes are not important is not justified. Industry studies have shown that flanges, heat exchanger components, and other non-pipe components have non-negligible failure probability. Consideration of possible AB flooding effects was not evident. Also, termination with open-ended makeup for a LOCA that does not permit sump recirculation is a bit aggressive. Further, some of the ISLOCA CDF sequences appear to credit recirculation and containment cooling. This appears to be inconsistent with other ISLOCA treatments and may be reducing the ISLOCA CDF. If so, this could have a significant impact on LERF.	events.
AS-03	Resolved	The Summer PRA includes a model for consequential LOCAs. A review of the consequential small LOCA model showed that only RCP seal failures given loss of cooling were treated as consequential LOCAs.	Failure of Pressurizer PORVs and Safety Valves to reseat following lift were not initially considered consequential LOCAs in the VCSNS model. These failure modes have been added, and this resolution applies satisfactorily to a Fire PRA as well.
AS-08	Resolved	Injection of 2 of 2 accumulators to the unbroken loops is required for success of LPI for Large LOCA initiating events. The success criteria basis for this is the FSAR. Unless an alternate success criterion is developed for the PRA using an appropriate T/H model, the licensing basis should be modeled.	Injection of 2/2 ECCS Accumulators to the remaining (unbroken) loops for Large LOCAs was added to enable success to resolve this F&O. Revising the success criteria in this manner matches the FSAR criteria and this resolution applies equally as well to a Fire Model as to an Internal Events Model.
SY-01	Resolved	A review of the VC Summer top logic fault tree indicates that the logic for the total loss of CCW (%LCC initiator) does not account for failures of support components which may contribute to the initiating event frequency. The logic under gate %LCC includes only faults within the CCW system itself. This is contrary to the approach used in the total loss of service water, loss of instrument air, and other special initiator portions of the fault tree, where failures of support equipment appear to be factored into the logic. The assumed system alignments are CCW Train A normally running, with Train B in standby and swing pump C aligned to Train A; and both trains of Service Water normally running, but only one train required for operation. It is also assumed that maintenance is done on a train basis (e.g., train B	To address this F&O, the Component Cooling Water support systems (Service Water, and AC/DC Power) were added to the Loss of CCW initiating event (special initiator) tree structure. This was necessary to make the model reflect the true initiator impact, and does not affect the development/integrity of the Fire PRA.

Table U-1 Internal Events PRA Peer Review (WOG Peer Review) – A and B Level Findings and Observations

SR	Status	Finding/Observation	Disposition
		CCW and train B SW would be in maintenance at the same time, so that the focus of these comments is on faults other than test & maintenance). Failure to include the potential for failure of support equipment for the standby train can lead to an underestimate of the initiating event frequency (assuming that such failures are not already captured in the cutsets for another initiating event already modeled). For the LCC event, failures of the B train of Service Water would defeat the B train of CCW, either prior to or subsequent to failure of the A train of CCW, and might contribute significantly to the total loss of CCW frequency; failures of opposite train AC power would also contribute, but likely less significantly.	
SY-05	Resolved	The diesel fuel day tanks at Summer contain enough fuel for about 1.5 hours of full load operation for each diesel. For the extended mission times associated with loss of offsite power, the diesel fuel day tanks will need to be refilled about once or more an hour depending upon the control band. Thus, the fuel oil transfer pumps will be cycled multiple times. The Summer PRA model for the diesel generators do not include independent or common cause failure of the transfer pump and thus do not address the need to refill the day tank or the cycling of the transfer pumps. It is difficult to argue that this is covered by the generic diesel failure rates because the bulk of the data is based on one hour test runs.	This finding was generated because the VCSNS PRA did not model the EDG Fuel Oil Transfer Pumps. The pumps (and associated common cause failures) have been added to the model. This resolution is equally applicable to Fire PRA.
SY-07	Resolved	The reviewers identified two related issues regarding the EFW model: (1) The mission time modeled in the PRA for EFW is 4 hours for transients, and 7 hours for LOCAs/SI events requiring depressurization to allow LHI. The latter mission time is appropriate, since it reflects the time for which EFW is needed during the sequence, with the LHI mission time accounting for the remainder of the sequence mission time of 24 hours / stable end state. However, the 4 hours transient mission time for EFW is based on the time in which the plant is expected to reach RHR entry conditions, beyond which normal RHR would be required for continued heat removal. But the VC Summer PRA does not model RHR for transients. So, by limiting EFW mission time for transients to 4 hours, the PRA does not account for a 24 hour mission time. While the "assumed success" of normal RHR following initial cooldown via EFW may have been a reasonable approximation for the IPE, it is contrary to NRC and industry expectations (e.g., as stated in the ASME PRA Standard) for current technology PRAs. Each sequence	Emergency Feedwater mission times for transient events were extended to 24 hours to resolve this observation. A second item in this F&O discussed the need to model Condensate Storage Tank refill capability. VCSNS did not implement this recommendation, choosing instead to document why modeling is not required. Neither of these resolutions impact the methods used in developing and implementing a Fire PRA.

Table U-1 Internal Events PRA Peer Review (WOG Peer Review) – A and B Level Findings and Observations

SR	Status	Finding/Observation	Disposition
		should account for at least a 24 hour mission time (if stable end conditions have been achieved), or longer if necessary to demonstrate stable sequence end conditions. (2) The useable capacity of the condensate storage tank for EFW supply is insufficient for a 24 hour mission time. Thus, a backup or alternate source of EFW supply is required to allow crediting EFW as a sole means of achieving success for transients. However, this backup alignment is not modeled in the PRA.	
DA-02	Resolved	The procedure for deciding when to apply Bayesian updating vs. relying only on generic or plant specific data in the Guidance PSA-05.doc is questioned as it is not necessary and has not been consistently applied. A check was made on 6 failure rates that were developed using only plant specific data vs. what would have occurred if Bayesian updating had been consistently applied. In 3 cases the Bayesian update provides reasonable agreement with point estimates developed entirely from the plant specific evidence, but in 3 cases significant differences were noted mostly in the direction of higher values using the Bayesian method. In the case of SW pump fail to run a factor of 3 discrepancy was identified. In addition, the statistical methods used in both procedures are internally inconsistent (Chi Squared vs. Bayes). Statistical rules of thumb on when it is necessary to Bayesian update or not are much less desirable than applying Bayes itself to answer this question. If such valid formulas were applied they would be more complicated that just doing the Bayesian update all the time. The current procedure defeats the whole purpose of Bayesian updating: namely to figure out how to weigh the contributions of generic evidence and plant specific evidence in the development of a probability distribution. If very little evidence is applied, Bayes will return an updated distribution very similar to the generic distribution and when there is a lot of plant specific evidence it will return something very close to the current chi squared treatment. But in every case in between the appropriate weight will be applied. Finally, by deciding how to selectively apply Bayes you are just adding a step that really is not necessary, yet it creates another opportunity to introduce arbitrary judgments into the data handling flowsheet.	This F&O dealt with a reviewer's preference that Bayesian updating be used in all cases as opposed to utilizing a set of rules for when Bayesian updating is appropriate. VCSNS elicited an expert opinion and chose to leave the rules in place vice 100% Bayesian updating. This does not impact the development of a Fire PRA.
DA-03	Resolved	VC Summer PRA has quantified "fatal" common cause failure events, that	Common cause was initially modeled for "fatal" combinations of

Table U-1 Internal Events PRA Peer Review (WOG Peer Review) – A and B Level Findings and Observations

SR	Status	Finding/Observation	Disposition
		is, common cause failure of a given component type that would result in guaranteed system failure, and has then combined the various CCF elements for a system into a module which is inserted at the top of the system fault tree. This can result in missing "non-fatal" common cause failure combinations which when combined with a single random failure of another component will result in system failure. A key example is found in the EFW common cause failure module EFW-CCF-All. This model includes a gate for common cause failure of the 2 motor driven pumps AND an independent failure of the TD pump. The module also includes a common cause failure of all 6 of the valves 3531, 3541.3551, 3536, 3546, and 3556. One combination that is not captured is common cause failure of 3531, 3541 and 3551 combined with an independent failure of the TD pump.	failures at a high level. This method could result in some combinations of common cause failures being missed when paired with random failures. To resolve this issue, common cause was modeled at the component level to ensure that both fatal and non-fatal combinations are captured. This rework of the common cause model does not affect Fire PRA.
DA-08	Resolved	Independent reviews of the CCF treatment have identified a number of issues that are currently being investigated for a future update. The purpose of this F&O is to provide input from a review team member who was responsible for developing many of the current industry methods for CCFA. The first issue is the treatment of failure to run of CCW pumps in the Loss of CCW initiating event frequency calculation: the issue is what is the appropriate mission time. The answer is 8760 weighted by the plant annual average availability (even though only one CCW pump is normally running, since another must start once the first fails, to prevent loss of CCW). This is expected to result in relatively high loss of CCW frequency and loss of SW frequency and such results may be inconsistent with industry experience. Rather than shorten the mission time, alternative approaches should be used to attempt a more realistic treatment. The first is to question the magnitude of the beta factors that are derived from industry sources as very few if any of the experienced CCF events have actually resulted in a total loss of CCW or SW. Data screening for a severity factor is one approach to address this. An additional step is to consider a recovery action that would restore CCW or SW cooling following the initial loss that causes a plant trip. The bottom line is that this issue has nothing to do with the mission time which should be set as the time the pump failures are "at risk to cause the initiating event". The second issue is the treatment of CCF between the motor and turbine drive pumps. A review of the actual CCF event data for AF pumps reveals	This observation involved four separate common cause issues. The items were resolved by changing (independently) the VCSNS common cause deficiencies noted. Common cause modeling does not affect the Fire PRA.

Table U-1 Internal Events PRA Peer Review (WOG Peer Review) – A and B Level Findings and Observations

SR	Status	Finding/Observation	Disposition
		that mechanical failure CCF events are dominated by the presence of common suction path for the pumps which may lead to steam binding, air binding or debris clogging both pumps and therefore unless very good justification can be provided for why these do not apply to Summer, the AFW pump group should include both types of pumps. This is actually recommended in NUREG/CR-4780. Alternatively if some justification can be provided this is inconsistent with the generic data that is used to quantify the CCF parameters for these components. A third issue identified in this review is the need to consider CCF failure modes of heat exchangers and strainers in the SW system that arise from debris getting past the traveling screens and clogging the SW side of heat exchangers and any SW strainers. Data for this failure mode is in the INEEL CCF database. A final related issue is tied into another issue in the Systems Analysis element regarding the omission of the EDG fuel transfer pumps from the SBO model. When this is added a common cause group involving these fuel transfer pumps should be added to the model (see SY-05).	
HR-02	Resolved	A generic set of arguments is made in the HRA calc to summarily dismiss the potential for miscalibration of redundant instruments in the PRA model. These arguments, while including valid considerations that should be reflected in this aspect of the evaluation, are viewed by the review team to be insufficient to justify global elimination of this important class of human actions from the model. There is one specific class of miscalibration events that have appeared in industry data sources such as the common cause data that have been caused by errors in the calibration procedures, for example.	Mis-calibration common cause events were added to the model to address this F&O. Adding these common cause events does not impact the Fire PRA methodology.
HR-03	Resolved	The time window used in the HRA calc for bleed and feed actions is 30 minutes for all scenarios. The footnote in Table A-2 refers to the success criteria for Task 26 which derived a value of 45 minutes for certain transient initiating events using 1 PORV. The actual task in the success criteria reference is Task 36. In Task 18 of the success criteria notebook it is stated for Small LOCAs that the time window is 15 minutes using 2 PORVs. Hence the use of 30 minutes as indicated in the Appendix A table is not appropriate for action OAB1.	Mission times for several operator actions were revised to be scenario-specific, and consistently documented. An HRA was performed for the Fire PRA to ensure the fire attributes were considered. Resolution of this F&O did not adversely impact this analysis.
HR-05	Resolved	Table B-2 in Appendix B of Calculation DC00300-134 shows the	Peer reviewers commented on the basis for choosing dependency

Table U-1 Internal Events PRA Peer Review (WOG Peer Review) – A and B Level Findings and Observations

SR	Status	Finding/Observation	Disposition
		dependent human actions in the Summer PRA. This table lists the level of dependency for the cognitive and execution portions of the HEP, however there is no discussion of the basis for assigning the level of dependency. Combination 1 in Table B-2 is failure of operator actions to manually actuate LCV0115C and LCV0115E. Both of these actions are for the same function and occur at the same time, therefore it appears that they should be highly correlated. The HEP for the second action is calculated as 0.50335. There are several combinations in Table B-2 such as Combination 7 involving what appear to be 3 concurrent actions in response to a loss of CCW including restoring the swing pump, restoring cooling water to CV pumps from one source, and restoring cooling water to CV pumps from a second source. These HEPs are then adjusted from a cumulative human recovery credit from 3E-6 to about 4E-5. While some adjustment is made to reflect dependence, the degree of dependence assumed is weak and the value for the combined HEP is extremely small for what the reviewers consider to be a very high stress event.	levels between operator manual actions in the internal events model. The HRA Calculation was revised to address these issues. Dependency levels were re-reviewed as part of developing the Fire PRA. The resolution of the F&O did not affect Fire PRA development.
HR-06	Resolved	It is not clear that the full plant level perspective of the symptoms and plant conditions that may influence the time available to perform Type C actions have been adequately taken into account. For example for sequences involving operator actions after a loss of CCW or loss of SW initiating events, it was not evident that the interactions and complexities associated with the plant being in multiple procedures at the same time was taken into account. The HRA evaluation of these actions make reference to the loss of CCW procedure but do not explicitly address the additional procedures such as E-0, procedures to cope with loss of CCW to charging pump and CVCS heat exchangers, etc. that the operators will be involved with during the scenario. Hence when the time window is compared with the time needed to complete a given action the time needed to address concurrent activities is not explicitly considered. This issue relates also to the treatment of human action dependencies in the following respect. The HEP values including the time window analysis is done for sequences independent of the underlying cutsets. Some of the cutsets involve concurrent human actions whose time to complete will be competing with those of a given action. Hence for these cases the time windows should be further adjusted.	The reviewer for this F&O felt that a "full plant perspective" was not apparent in the timing and dependency evaluations for HRA. To address this, Operators were interviewed to gain a larger prospective for events having a plant-wide impact. Some dependency levels were changed based on these discussions. Dependency levels were re-reviewed and documented as part of developing the Fire PRA. The resolution of the F&O did not affect Fire PRA development.

Table U-1 Internal Events PRA Peer Review (WOG Peer Review) – A and B Level Findings and Observations

SR	Status	Finding/Observation	Disposition
HR-08	Resolved	The HEP value for PXOPMANUALRTHE, manual rod insertion during ATWS, appears to be optimistic at 1E-4 per demand in view of the very short time window for such actions, which is assumed in this analysis to be only 2 minutes. This does not appear to be internally consistent with other TYPE C actions in which longer time frames are available. In addition, this action is applied in many cutsets with additional human actions and common cause failures that would contribute to stress and compete for time. A review of the WOG PRA Results and Comparisons database indicates that HEPs applied for this action in various PRAs range from 1E-2 to 1E-4. In the HRA Calc appendix that documents time windows it is stated that less than 1 minute is available (as opposed to the 2 minutes noted above) and a statement is presented that this action is not time dependent. Although the action in question is a memorized "immediate action", any action that has to be done in less than 1 minute or even 2 minutes must have at least some degree of time dependence.	To resolve this observation regarding an HFE with short time frame, VCSNS reviewed the HFEs with short time windows and performed time-reliability models to update one HRA probability. An HRA was performed for the Fire PRA to ensure the fire attributes were considered. Resolution of this F&O did not adversely impact this analysis.
DE-03	Resolved	The following observations were made regarding the internal flooding analysis. 1. The internal flooding analysis, as documented in the IPE Internal Flooding Analysis Notebook, included a number of assumptions, which are documented in Section 1.3 of the Internal Flooding Analysis notebook. The set of assumptions is reasonable with the possible exception of following: (a) Walls and doors are assumed to remain intact throughout the flooding event, and doors are assumed to remain intact and in their normal position. This is optimistic, and ignores the potential that non-water-tight doors could be failed by a rising water level, or that normally closed doors might be inadvertently left open, allowing flood propagation to adjacent rooms/areas. (b)The potential for propagation through drains (grates, openings between floors, etc.) or vent lines is not addressed in the assumptions, nor is the ultimate disposition of the water, although the room-by-room evaluation indicates that propagation was considered in the analysis. However, where propagation is considered, it reflects the assumption noted in item 1 above, i.e., doors are assumed to limit propagation potential perfectly. Review of the room-by-room screening documentation in the flooding notebook indicates that potential flood propagation was considered for each area, although details of the evaluation are sometimes sketchy. The	Resolution of this F&O involved updating the VCSNS Flooding analysis. Updating this analysis does not have an impact on the Fire PRA.

Table U-1 Internal Events PRA Peer Review (WOG Peer Review) – A and B Level Findings and Observations

SR	Status	Finding/Observation	Disposition
		extent of propagation considered is limited by use of the above assumptions, e.g., for some rooms, propagation is assumed to only be possible through the gaps under the doors, whereas additional propagation might be possible if failure of the doors was considered. 2. The IPE analysis makes assumptions regarding status, and even presence, of flood barriers. Since these assumptions are an integral part of the analysis, they should be confirmed as still applicable (e.g., curbs still present). 3. The internal flooding analysis uses the existing transient accident scenarios to model plant response to an internal flooding initiator, appropriately failing equipment identified as potentially affected by the initiator. However, it does not appear that flood scenario-specific consideration has been given to human actions that are incorporated into the selected transient models. Although many such actions would likely not be affected, it is important to evaluate to determine that each action is still possible given the flood effects, that cues for action are not adversely affected by the flood, and that response times inherent in existing HEPs are not significantly changed by the flood scenario.	
DE-04	Resolved	The Summer PRA does not model common cause blockage of the containment sump filters after switchover to recirculation cooling following a large or medium LOCA. The blowdown phase of a LOCA may produce sufficient debris in the sump to plug or significantly reduce the flow through the sump screens. This could result in failure of ECCS sump recirculation.	VCSNS added a new basic event to include common cause failure of the containment sump filters (due to blockage during the recirculation phase) to address this F&O. Adding this basic event does not impact the methodology in the Fire PRA.
DE-05	Resolved	The diesel generators are modeled as depending on room ventilation, with 1 of 2 ventilation fans being sufficient. Common cause failure of the diesel generator room ventilation fans was not modeled. Common cause failure of 2 of 2 fans for a given diesel will result in failure of the affected diesel. Common cause failure of all four ventilation fans will cause failure of both diesels.	Resolution of this F&O involved adding new common cause failures for EDG room ventilation fans. Adding these new failure modes does not negatively impact development of a Fire PRA model.
QU-04	Resolved	During the review several updates of quantification results were presented to the review team, including Rev 3H. An earlier set of results was presented in Revision 2 that included the treatment of dependent human actions. Because this step in the quantification procedure influences the results and the profile of contributing accident sequences and cutsets, it should be recognized that any quantification update is incomplete until this	Resolution of this F&O involved changing VCSNS PRA guidance to ensure multiple operator action strings are evaluated for dependence after each change in the PRA HRA. This has no effect on development of the Fire PRA.

Table U-1 Internal Events PRA Peer Review (WOG Peer Review) – A and B Level Findings and Observations

SR	Status	Finding/Observation	Disposition
		dependent actions review step is done.	
QU-06	Resolved	One of the updates presented to the review team included a sensitivity analysis to address "unusual" sources of uncertainty. However a parametric uncertainty analysis was not performed. Future major updates should include an update of the sensitivity analysis and a parametric uncertainty analysis, as such analyses may be needed for certain risk informed applications.	This F&O was resolved by performing updates to the sensitivity analysis and parametric uncertainty analysis for all major updates. Performing these updates after each major revision does not have a negative impact on the Fire PRA.
QU-07	Resolved	A results summary was provided for a recent update to support the review. This summary included basic results for CDF, LERF and major contributions to LERF and some information that sensitivity analyses had been performed, but the results of these analyses and the insights they support were not included in the summary. It is true that the sensitivity analyses were documented elsewhere in terms of numerical results, but the insights that such analyses normally are expected to provide should be evident in the results summary. Missing entirely from the summary are insights about the contributors to risk, key plant features that impact the results, any unique or specific modeling approaches that influence the results, and results of parametric uncertainty analysis (which was not performed).	As in QU-06, resolution of this F&O involved performance of sensitivity and uncertainty analyses. Performance of such evaluations does not impact Fire PRA development.
L2-02	Resolved	Early containment overpressure failures are not included in the Summer LERF model. At least philosophically, this is a significant exception from the NRC simplified LERF model in NUREG/CR-6595 and the LERF model at most other plants. The basis for this exception is covered in a brief qualitative discussion in CN-RRA-02-42 with a pointer to quantitative evaluation in CN-RRA-02-51. Because of the "philosophical significance" of this exception, CN-RRA-02-42 should include a very thorough discussion of the basis for not including early containment overpressure failure in the LERF model. This discussion should address key uncertainty issues such as the amount of zirconium oxidation and other severe accident phenomena that affect the magnitude of the containment pressure challenge.	The reviewer felt that some methods for early containment failure were discounted in the VCSNS PRA model without adequate justification. To resolve this issue, VCSNS improved documentation for the assignments and generated a new calculation to house the associated bases. Generation of this package does not impact the Fire PRA.

Table U-2 Internal Events PRA Peer Review (Reg. Guide 1.200 Gap Assessment) – Findings and Observations

SR	Status	Finding/Observation	Disposition
IE-01-GA	Resolved	In the original peer review, a B level F&O, IE-06, was issued for the ISLOCA analysis. One of the primary items was concern about the variance/polynomial treatment for quantifying the ISLOCA frequency (part of the "state-of-knowledge" issue") and the treatment of different valve and component failure modes. A second F&O, AS-01, Significance Level B, raised concerns about the failure to treat large pipe failures and crediting recirculation to mitigate ISLOCAs. The ISLOCA treatment was revised. The ISLOCA frequency was calculated using the variance treatment. While the resulting frequency was a factor of 20 higher than the baseline, it was concluded that this was not significant and could be treated in the uncertainty analysis. It was not used to calculate the error factor and was only used in a sensitivity analysis. Large pipe breaks were addressed by introducing a split fraction that said 1% of ISLOCA initiators resulted in a pipe break. A review of the ISLOCA cutsets showed one cutset with an ISLOCA resulting in a large pipe break outside containment and failure to control ECCS flow. This is not a valid cutset. It is an artifact of the model structure which assumes mitigation even when a pipe break has occurred without fully achieving a safe stable end state. Mr. R. Lutz was asked to review the ISLOCA supporting analyses to identify the basis for the revised ISLOCA. The results of this review indicated that the accident progression for an ISLOCA involving a pipe break outside containment in the 12 inch RHR suction line is based on the expected plant response as documented in the original IPE Success Criteria Notebook (Reference 15 in CN-RRA-02-81). Since there are no valves in the RHR suction line outside containment, a break in that line would disable the LPI injection function for the pump in the affected train. Thus, RWST drain down would be limited to one LPI pump and 2 charging pumps. The IPE Success Criteria Notebook indicates that for a completely depressurized RCS, this would drawdown the RWST at a rate of 3930 gpm. At some time into the event, the operators would go through the V. C. Summer Emergency Operating Procedures and stop all SI pumps and align a single charging pump to take suction from the RWST and discharge through the normal charging pathway that can be throttled (and the flow rate is indicated in the control room). This is detailed in Appendix A of CN-RRA-02-81 and is shown to be able to be completed within 40 minutes. The original IPE success criteria then assumed that the operators would throttle RCS makeup to match the curve in the EOPs. In this case, if ECCS was terminated and throttling started at 44 minutes, the RWST would last for exactly 24 hours. CN-RRA-02-081 references CN-RAS-95-	This comment was resolved in conjunction with Internal Events F&O's IE-06 and AS-01. The resolution/impact stated above is the same for this Gap Analysis comment.

Table U-2 Internal Events PRA Peer Review (Reg. Guide 1.200 Gap Assessment) – Findings and Observations

SR	Status	Finding/Observation	Disposition
		57 for the 40 minute success criteria. CN-RAS-95-57 simply took the original IPE success criteria (44 minutes) and updated it for the power uprating to show that it is now 41 minutes, which was rounded to 40 minutes in CN-RRA-02-081. Thus, terminating all ECCS flow and initiating normal charging using suction from the RWST is a valid response to the ISLOCA pipe break event. There are two weaknesses in this success criteria: 1) The assumption that ECCS flow is stopped at 40 minutes and the normal charging pathway, taking suction from the RWST, is used just gets to 24 hours before the RWST is emptied. This is not a safe stable state. Revising the PRA to model RWST refill at a rate of at least 115 gpm (see table 3.9 of the IPE Success Criteria Notebook adjusted for the 4% power uprating from CN-RAS-95-57) would resolve this issue. 2) The operator action to terminate SI, re-align a charging pump to the normal charging discharge pathway (but taking suction from the RWST) and then continually throttle the charging pump flow according to the plot in the EOPs is a key modeling assumption that is not modeled in the PRA. Without success in stopping the ECCS pumps and re-aligning a charging pump, RWST refill would have to be started before 100 minutes and at a rate of 3930 gpm. Revising the PRA model to include this operator action would resolve this issue. The ISLOCA analysis needs to be revisited. First, if mitigation is to be credited, refill of the RWST and the operator action to terminate SI and re-align the charging pump need to be modeled. Alternately, the pipe rupture branch can be taken directly to core damage. Second, once these model changes are made, the variance treatment needs to be revisited, particularly for those sequences that can lead to a large pipe break outside containment. Calculation of rupture probability should consider, at least qualitatively, all low pressure components in the line and where the break is credited as small enough to mitigate, the bases need to be carefully and thoroughly documented.	

Table U-2 Internal Events PRA Peer Review (Reg. Guide 1.200 Gap Assessment) – Findings and Observations

SR	Status	Finding/Observation	Disposition
IE-02-GA	Resolved	VCSNS Calculates their initiating event frequency based on a reactor critical year basis. However, they do not adjust them to account for the fraction of time that the plant is at power during a given year. Adjust the initiating event frequencies by the fraction of time that the plant is at power during a calendar year. That can be accomplished by multiplying the initiating event frequencies by the average plant availability. Since all IEs are based on reactor year currently, a simple approach to addressing this is to multiply CDF by availability.	Resolution of this finding involved multiplying the overall CDF by plant availability to account for the time the plant is at power. (Initiating event frequencies are calculated on a critical reactor year basis.) This resolution does not negatively impact development of the Fire PRA.
AS-01-GA	Resolved	See original F&O SY-07, Issue 2. The issue is that the CST is credited as lasting throughout the 24 hour mission time so realignment is not modeled. VCSNS decided to address this issue by providing a number of qualitative arguments as to why the treatment was appropriate. The arguments were not conclusive. The minimum inventory in the CST, 179,850 gallons, is stated to be adequate to maintain the plant in hot standby for 11 hours, but this is not demonstrated to be adequate for 24 hours. The next argument is that the CST level would be above the low level alarm setpoint at the time of the transient and would have an inventory of over 350,000 gallons. This appears reasonable, but there is no calculation that this inventory is sufficient for 24 hours of operation. There is also no proof that the level will be above the low level alarm point. The tech spec limit is the 179, 850 gallons. VCSNS needs to provide additional proof of the added inventory using alarm response procedures to show that the CST is promptly refilled on a low level alarm and provide plant operating experience to demonstrate that the tank always has greater than 117,850. VCSNS also stated that there are three redundant alternatives. The first two involve manual actions (refill CST or switch to hot well) which would probably involve highly dependent operator actions (diagnosis). Note also that, depending on the initiator, the hot well may have only a few hours supply. The third alternative is an automatic realignment to service water. These are all argued to be highly reliable, with limited bases, so that they don't need to be included in the model. VCSNS should provide stronger, more quantitative arguments to address the issues above or incorporate refill of CST in the model. The volume arguments may be the most effective when the decrease in decay heat is considered, but a calculation of some sort should be performed.	This comment was resolved in conjunction with Internal Events F&O SY-07. The resolution/impact stated above is the same for this Gap Analysis comment.

Table U-2 Internal Events PRA Peer Review (Reg. Guide 1.200 Gap Assessment) – Findings and Observations

SR	Status	Finding/Observation	Disposition
AS-02-GA	Resolved	VCSNS does not have a stand-alone database or document identifying all of the assumptions or sources of uncertainty included in their PRA. The VCSNS practice is to capture the assumptions associated when each element of the PRA in the documentation associated that element or in the PRA update documentation. DC00300-146 contained a small set of assumptions, but there is no indication they had been reviewed for significance. A review of the updated success criteria report indicated that there was no compilation of assumptions used but assumptions could be identified by a careful reading of the individual tasks. In the event tree notebook, DC00300-130, the assumptions section states that the assumptions are contained in the individual event tree sections. The assumptions could be identified through a careful reading of the text, but there was no assessment of the importance of the assumptions and there was no compilation of the assumptions. A review of the HRA Documentation also shows that it is difficult to identify the assumptions and there appears to be no assessment of the significance of assumptions. The Systems Notebooks were also reviewed and they have a fairly good set of assumptions for each of the systems analyses. Again, there appears to be neither an assessment of the significance of the assumptions nor an assessment of the uncertainty. VCSNS *should consider establishing a compilation of the assumptions* used in their PRA model. As a minimum, VCSNS should identify and track key sources of uncertainty, in particular, epistemic uncertainty. The assumptions should be identified by PRA Element and include at least a qualitative assessment of the importance of each assumption. Note that no problems were identified with respect to specific assumptions or the ability to ascertain the validity of any specific analysis. This is primarily a documentation issue.	This item dealt with documentation of assumptions and their impacts/uncertainties on the model. To resolve the issue, VCSNS improved the method of documenting assumptions as changes are made to the model. This change to the method of documentation does not impact development of the Fire PRA.
HR-01-GA	Resolved	Capability Category 2/3 for this SR contains a list of 11 PSFs that must be explicitly addresses when estimating HEPs for significant human actions (Type C). VCSNS uses the old Scientech implementation of the EPRI Cause Based Decision Tree Methodology (CBDTM) which explicitly considers a limited set of PSFs, time available and time required to complete a response, stress level and complexity of the response. The new EPRI HRA Calculator includes provisions for explicitly addressing all of the PSFs listed in the Capability 2/3 requirements for SR HR-G3. It is recommended that VCSNS switch to the HRA Calculator at least for the	This F&O involved the Performance Shaping Factors chosen for HEPs. VCSNS adopted the EPRI HRA Calculator (which explicitly addresses the required PSFs) to address this F&O. PSFs are also addressed in detail in development of the Fire PRA. Resolution of this F&O does not adversely impact Fire PRA development.

Table U-2 Internal Events PRA Peer Review (Reg. Guide 1.200 Gap Assessment) – Findings and Observations

SR	Status	Finding/Observation	Disposition
		significant human actions.	
HR-02-GA	Resolved	See F&O HR-06 from the original peer review. This F&O needs to be addressed.	This comment was resolved in conjunction with Internal Events F&O HR-06. The resolution/impact stated above is the same for this Gap Analysis comment.
HR-04-GA	Resolved	VCSNS has performed a dependency evaluation for combinations of human actions that occur together in cutsets. The documentation includes a table that shows the HEPs that occur in combination arranged in time order and assigns a dependency level (CD, HD, MD, LD and ZD) for both the cognitive and execution portions of the second and subsequent actions. However, there is limited discussion of the factors considered in determining the dependency level and there is no documentation of the basis for assigning the dependency levels for various HEP combinations. A review of Table B-2 "Dependent Basic Event Combinations and Dependency Levels" revealed several combinations for which the dependency levels might be questioned. These include {PXOPMANUALRTHE (OPERATOR FAILS TO MANUALLY INITIATE A REACTOR TRIP) / MRI_2 (FAILURE OF MANUAL ROD INSERTION)} or {CCPM---XPP1CHE (OPERATOR FAILS TO MANUALLY ACTUATE MDP XPP-1C) / OAAC (OPERATOR ACTION TO ESTABLISH ALTERNATE COOLING TO CS PUMPS)}. VCS should improve their documentation of the dependency analysis in several areas. First, there should be a discussion of the specific factors considered when evaluating the dependency between actions. These factors should cover those listed in SR HR-G7. Second, VCSNS should indicate the basis for assigning the dependency levels for the second and subsequent actions in a set, especially for the LD and ZD dependencies.	This finding detailed a lack of documentation concerning the assigned level of dependence between HEPs. VCSNS improved documentation and provided the bases for dependence assignments. This does not impact Fire PRA development.
DA-01-GA	Resolved	The VCSNS Data Analysis Guidance, PSA05, focuses primarily on the Bayesian Analysis process and provides limited guidance on how to actually collect the plant specific data that is used. Supporting Requirements (SRs) DA-C4, DA-C5, DA-C6, DA-C7, DA-C8, DA-C9, DA-C10, DA-C11, DA-C12 and DA-C13 identify a number of specific concerns associated with the use of plant specific data. It is recommended that PSA05 be updated to specifically address these concerns to the extent that it is possible to discern the practices used at VCSNS. The updated guidance should specifically address how failure counts are determined,	This comment was generated due to lack of detail in the documented process to perform data updating. VCSNS revised the data update guideline to define the process and rules used. This does not impact Fire PRA development.

Table U-2 Internal Events PRA Peer Review (Reg. Guide 1.200 Gap Assessment) – Findings and Observations

SR	Status	Finding/Observation	Disposition
		how success (hours/demand) is determined and how test/maintenance unavailability is determined. This should be tied to the maintenance rule program documentation.	
DA-02-GA	Resolved	A review of the revision 4 update report, the data update documents and the data analysis process document, PSA05, revealed that there were few data analysis assumptions explicitly listed. Some assumptions could be picked out by careful reading of the documentation and others could be inferred. While VCSNS does not appear to have used any inappropriate assumptions, the data analysis assumptions need to be documented in a manner that facilitates evaluation of these assumptions. (See AS-02-GA above.)	Similar to AS-02-GA above, this finding concerned lack of detail regarding assumptions in the VCSNS analyses. VCSNS improved the level of detail in the update guideline and the HRA guideline and calculations. These changes did not impact development of the Fire PRA.
QU-03-GA	Resolved	The update 4 report, DC00300-146, does not provide the importance measures for the updated model. This is a requirement of SR QU-F2. The importance measures report should be generated and added to this report.	This finding documented that VCSNS updates did not include importance measures for basic events. VCSNS now includes both CDF and LERF importance measures in model updates. This doesn't impact Fire PRA development.
QU-04-GA	Resolved	SR QU-F4 has been revised in Addendum B to the ASME PRA Standard. The revised SR reads, "Document key assumptions and key sources of uncertainty, such as: possible optimistic or conservative success criteria, suitability of the reliability data, possible modeling uncertainties (modeling limitations due to the method selected), degree completeness in the selection of initiating events, spatial dependencies, etc." While to a limited extent, some of this information can be found scattered through the existing documentation, it is generally only indirectly addressed and it is not covered in any coherent fashion. VCSNS may want to consider adding a new section to their update reports to specifically discuss the major areas of assumptions and uncertainties listed in this SR. VCSNS should also think about any items unique to their plant or model.	Similar to AS-02-GA above, this finding concerned lack of detail regarding assumptions in the VCSNS analyses. VCSNS improved the level of detail in the update guideline and the HRA guideline and calculations. These changes did not impact development of the Fire PRA.
QU-05-GA	Resolved	VCSNS does not have a definition of "Significant". VCSNS should update their quantification process to add a definition for "Significant". This definition should be consistent with the definition in section 2 of the standard. Note that the definition of "Significant" will factor into documentation of what is reviewed and documented. Therefore, the updated procedure should also address the documentation of "Significant" assumptions and sources of uncertainty as well as the review of significant	This finding recommended that VCSNS include a definition of "significant" in the quantification process. VCSNS added the definition to the quantification guideline. This does not adversely impact the Fire PRA.

Table U-2 Internal Events PRA Peer Review (Reg. Guide 1.200 Gap Assessment) – Findings and Observations

SR	Status	Finding/Observation	Disposition
		cutsets and accident sequences. VCSNS should look at the SRs that talk about "Significant" Items when updating the quantification process.	
DE-03 (Internal)	Resolved		Refer to the resolution of DE-03 for internal events.
SY-01-GA	Resolved	F&O TH-03 from the original peer review has not been resolved. Resolve this F&O. Also, VCSNS should perform some focused sensitivity studies looking at the uncertainty associated with the room temperature limit and the human action timing.	This comment dealt with treatment of room heatup calculations and credit for local operator action. Justification was provided for the chosen modeling, but no modeling changes were necessary. This resolution does not impact the Fire PRA.
HR-03-GA	Resolved	In the HRA Calculation DC-00300-134, VCSNS defines the time available to perform each operator action and the approximate time that the cues are expected. To confirm the timing information and to determine the source of the information and to determine if the information is best-estimate, conservative or generic, it is necessary to search through several; documents and exercise judgment as to which is the applicable reference. In the next update of DC-00300-134, VCSNS should include direct references to the TH analyses used to establish the timing for each Type C HEP. If VCSNS is going to convert to the new EPRI HRA calculator, good documentation of bases is readily supported.	This finding recommended better documentation of the timing bases for Type C HEPs. To resolve the issue, VCSNS developed a set of success criteria evaluations to cover the timing for a spectrum of scenarios. The HEP calculation was updated accordingly. HEPs are scrutinized during Fire PRA development, and resolution of this issue does not adversely affect Fire HRA development.
IF-01-GA	Resolved	One issue identified in F&O DE-03 from the original peer review was the assumption that doors would remain intact. This is an optimistic assumption that has been cited. VCSNS has an old hand calculation "demonstrating" the ability of the standard doors to hold against flood heights of 8". This evaluation is an extrapolation from a wind-loading analysis. For the updated flood analysis, VCSNS should expand on the analysis to include the calculation of the water height equivalents for the wind loads. Furthermore, after the flood depth re-evaluations are completed, VCSNS should review each room analysis to confirm that no door will be exposed to a water depth greater than 8". If any door does see a greater depth, VCSNS needs to calculate a failure probability based on the water depth actually anticipated.	This comment dealt with documentation of the VCSNS assumption that doors remain intact during flooding events. The flooding analysis was updated and additional documentation was provided to show that the assumption is valid. As with Finding DE-03 above, this resolution does not affect the Fire PRA.
QU-01-GA	Resolved	A review of the cutsets for revision 4 of the model revealed several cutsets	This F&O deals with cutsets involving multiple maintenance

Table U-2 Internal Events PRA Peer Review (Reg. Guide 1.200 Gap Assessment) – Findings and Observations

SR	Status	Finding/Observation	Disposition
		which contained two maintenance events. They tended to involve EDG maintenance and a maintenance event in another system. While the events identified were appropriate and the VCS review processes does discuss this concern, VCSNS may want review the cutsets and confirm that any cutset still containing multiple maintenance actions are appropriate. See F&O QU-08 from the original peer review.	activities (though the ones noted were deemed appropriate in the finding). To resolve the issue, VCSNS performed and documented a review of the cutsets and mutually exclusive file looking for such occurrences. Resolution of this finding did not impact development of the Fire PRA.
QU-02-GA	Resolved	The discussion of key sources of model uncertainty is somewhat limited. A quantitative parametric uncertainty analysis was performed and there was a limited set of sensitivity analyses linked to some specific changes in the update. However, the overall discussion of key sources of uncertainty seemed somewhat limited. VCSNS may want to consider developing a list of key sources of uncertainty and providing a discussion of the overall potential impact of these assumptions on the robustness of the model.	This comment noted that the discussion concerning key sources of uncertainty in VCSNS modeling was limited. Similar to AS-02-GA above, VCSNS documented the key sources of uncertainty and discussed their impact. This discussion/documentation did not impact development of the Fire PRA.
QU-06-GA	Resolved	This SR states that the plant should compare results with those from similar plants. Although DC00300-146 does not explicitly include a comparison of results to sister plants, the grade of 3 for QU-11 indicates that the original peer review team did not find any missing sequences noted for other plants or any unique outliers. Furthermore, VCSNS is participating in the WOG MSPI crosscomparison. Therefore, VCSNS is considered to meet CC-II for this SR. However, VCSNS may want to include a summary of the WOG MSPI cross-comparison results in the next update.	This finding recommended that VCSNS compare quantification results with those from similar plants' PRAs. VCSNS now performs and documents this comparison during each model update. This comparison does not impact the Fire PRA.
AS-01-2007	Open	The original gap analysis F&O AS-02-GA identified an issue with respect to the identification and characterization of assumptions for the VCSNS PRA. This issue has been resolved for the fifth major update of the VCSNS PRA. The changes made to the VCSNS PRA as part of the fifth major update are documented in DC00300-148. This documentation includes the assumptions made for each change and a characterization of the possible impact of the assumptions. Assumptions made in prior updates of the PRA are captured in Attachment 2 to DC00300-148. This resolves the issue for this update. However, a review of the VCSNS PRA procedures indicates that while there is a process for identifying and characterizing the assumptions made for a given update, there is no process to ensure that the assumptions for the immediate past update are rolled into Attachment 2 to be preserved. It is recommended that VCSNS	This is a suggestion to develop an assumption database to keep track of key assumptions and their impact. Although VCSNS evaluates the key assumptions and their impact for each model revision, a database for this has not yet been developed. Development of this database will not affect the Fire PRA.

Table U-2 Internal Events PRA Peer Review (Reg. Guide 1.200 Gap Assessment) – Findings and Observations

SR	Status	Finding/Observation	Disposition
		develop an assumptions database and then revise their update procedure to explicitly call for transferring all of the assumptions associated with a given model update into the database as one of the last steps in the update process. The initial load should include the current contents of Attachment 2 to DC00300-148 plus the assumptions associated with changes in the fifth major update of the VCSNS PRA.	
HR-01-2007	Open	The referenced SR requires that the once the overall HRA has been completed, the plant should perform a review of their HEPs for internal consistency with respect to scenario, context, procedures and timing. There is evidence that VCSNS did perform a consistency review and no issues were identified. However, this consistency review is not explicitly required in the VCSNS PRA procedures. It is suggested that PSA-04 be modified to explicitly require an internal consistency review be performed as part of each HRA update.	This is a suggestion that the HRA Guideline be updated to specifically require review of HEPs for consistency with respect to scenario, context, procedures and timing. (This review is performed at each HRA update, although it is not currently a specific requirement in the guideline.) Incorporating this into the guideline will not affect Fire PRA development.

V. Fire PRA Quality

55 Pages Attached

In accordance with RG 1.205 Regulatory Position 4.3:

> *"The licensee should submit the documentation described in Section 4.2 of Regulatory Guide 1.200 to address the baseline PRA and application-specific analyses. For PRA Standard "supporting requirements" important to the NFPA 805 risk assessments, the NRC position is that Capability Category II is generally acceptable. Licensees should justify use of Capability Category I for specific supporting requirements in their NFPA 805 risk assessments, if they contend that it is adequate for the application. Licensees should also evaluate whether portions of the PRA need to meet Capability Category III, as described in the PRA Standard."*

The Fire VCSNS PRA is judged to be consistent with the Fire PRA Standard for the elements reviewed and can be used for the applicable applications where the reviewed elements apply. In the areas where identified weaknesses impact a given application, additional bounding analysis may be required to support a given application.

A Peer Review was conducted during the period of August 16, 2010 through August 20, 2010. A follow-on peer review was conducted the week of February 21, 2011.

The purpose of the Fire PRA peer review process was to provide a method for establishing the technical capability and adequacy of a Fire PRA relative to the technical requirements in the ASME/ANS Combined PRA Standard. The Fire PRA peer reviews used the Supporting Requirements (SRs) in Section 4 of the ASME/ANS Combined PRA Standard. Per Section 1.6 of the Combined PRA Standard, these peer reviews were performed using a written process. The fire PRA peer review process is provided in NEI 07-12, which is based on the peer review process for the level 1 internal events PRAs as defined in NEI 05-04.

There were 51 SRs not reviewed during the original peer review due to the technical elements not being completely ready to be reviewed. These 51 SRs, in addition to six SRs associated with the technical element FSS that were reviewed, were reviewed as part of the follow-on peer review.

Section 4 and Section 1.5 of the ASME/ANS Combined PRA Standard contains a total of one hundred and eighty two (182) Supporting Requirements (SRs) under thirteen technical and configuration control elements. Of these 182 SRs, twenty one were determined to be not applicable to the VCSNS Fire PRA either due to the fact that the requirement were not applicable to the VCSNS approach or the technical element was not used for the Fire PRA analysis (e.g., QLS).

Table V-1 presents the peer review insights. Table V-2 presents the classification of Fire PRA peer review results. Table V-3 presents a summary of the overall results of the Fire PRA peer review. As shown in Table V-3, of the 161 SRs reviewed, 15 SRs (9.3%) do not meet the requirements and the majority, 146 SRs (90.7%), met the requirements with 141 SRs (87.6%) meeting Capability Category II or greater.

Table V-4 through V-14 provide a summary of the findings of the peer review at the High Level Requirement (HLR) level for the technical elements. Table V-15 provides a summary of the assessment for configuration control. Table V-16 provides a summary of the assessed Capability Category for all of the SRs.

During the follow-on peer review, nineteen Facts and Observations (F&Os) were generated –these consist of fifteen Findings and four Suggestions. Together, as a result of both the VCSNS Fire PRA Peer Reviews, a total of sixty four F&Os were generated. These consisted of forty two Findings and twenty Suggestions and two Best Practices. Table V-17 provides and summary of the Facts and Observations (F&Os) from both the peer reviews. Table V-18 lists the details of the peer review Findings, again from both the reviews. Note that in the Follow-on Peer Review, a number of SRs associated with the technical element FSS were reviewed again, and any F&Os generated earlier for these SRs were not included in this final report.

To combine the insights from Table V-3 and Table V-17 (the peer review summary table and the F&O summary table, respectively), the following comparison provides the relative insights of each of the technical elements. The first set of data gives the percentage of the SRs that were found to be "Not Met" relative to the total number of SRs in the respective Fire PRA element. The second set of data gives the percentage of SRs with Finding F&Os relative to the total number of SRs. The third set of data gives the percentage of SRs with Finding or Suggestion F&Os relative to the total number of SRs. The fourth set of data gives the percentage of SRs that were "Not Reviewed" relative to the total number of the SRs.

Table V-1 Peer Review Insights

Fire PRA Element	Total No. of SRs	Percent of SRs "Not Met"	Percent of SRs with Finding F&Os	Percent of SRs with Finding or Suggestion F&Os	Percent of SRs Not Reviewed
Plant Partitioning (PP)	12	8.3%	0.0%	16.7%	0.0%
Equipment Selection (ES)	14	21.4%	50.0%	64.3%	0.0%
Cable Selection (CS)	16	18.8%	18.8%	37.5%	0.0%
Plant Response Model (PRM)	20	0.0%	35.0%	45.0%	0.0%
Fire Scenario Selection (FSS)	50	2%	22%	28%	0.0%
Ignition Frequency (IGN)	15	6.7%	13.3%	26.7%	0.0%
Quantitative Screening (QNS)	6	0.0%	0.0%	16.7%	0.0%
Circuit Failure (CF)	3	33.3%	66.7%	66.7%	0.0%
Human Reliability Analysis (HRA)	12	8.3%	41.7%	58.3%	0.0%
Seismic Fire (SF)	6	33.3%	16.7%	16.7%	0.0%
Fire Risk Quantification (FQ)	10	10.0%	10.0%	30.0%	0.0%

Table V-1 Peer Review Insights

Fire PRA Element	Total No. of SRs	Percent of SRs "Not Met"	Percent of SRs with Finding F&Os	Percent of SRs with Finding or Suggestion F&Os	Percent of SRs Not Reviewed
Uncertainty and Sensitivity (UNC)	2	50%	50.0%	50.0%	0.0%
Maintenance and Update (MU)	9	0.0%	0.0%	11.1%	0.0%

Note: The F&O information for the technical element FSS is based solely on the follow-on peer review.

Table V-2 Classification of Fire PRA Peer Review Results

Tier	Classification Criteria	Fire PRA Elements
1	Percent of SRs "Not Met" ≥ 30%	CF, SF, UNC
2	Percent of SRs "Not Met" < 30% and > 0%	PP, ES, CS, FSS, IGN, HRA, FQ
3	Percent of SRs "Not Met" = 0% and Percent of SRs with Finding or Suggestion F&O > 30%	PRM
4	Percent of SRs "Not Met" = 0% and Percent of SRs with Finding or Suggestion F&O < 30%	QNS, MU

Note: The F&O information for the technical element FSS is based solely on the follow-on peer review.

Table V-3 Summary of Overall Results of the Fire PRA Peer Review

Fire PRA Element	Number of Supporting Requirements Meeting Each Capability Category									
	Not Met	Met	CC-I	CC-I/II	CC-II	CC-II/III	CC-III	Not Applicable	Not Reviewed	Total
PP	1	9				2				12
ES	3	7	1		2		1			14
CS	3	8			1		1	3		16
QLS*	0	0						7		7
PRM	0	16						4		20
FSS	1	25	4	6	4	8	0	2		50
IGN	1	7		1	1		1	4		15
QNS	0	4			1	1				6
CF	1	2								3
HRA	1	4			3	1	3			12
SF	2	4								6
FQ	1	8						1		10
UNC	1	1								2
MU	0	9								9
TOTALS	**15**	**104**	**5**	**7**	**12**	**12**	**6**	**21**	**0**	**182**

* VCSNS did not perform qualitative screening.

Note: The information for the technical element FSS is based solely on the follow-on peer review.

Table V-4 PRA Technical Element Summary: Plant Partitioning (PP)

High Level Requirement Number	Summary of High Level Requirement	Plant Partitioning Summary (by High Level Requirements)
HLR-PP-A	The Fire PRA shall define the global boundaries of the analysis so as to include all plant locations relevant to the plant-wide Fire PRA.	Attachment 1 to DC00340-001 provided a global boundary map and the table of the location relevant to the plant-wide Fire PRA. The list and the description of the buildings and location show that VC Summer met the associated SR requirement.
HLR-PP-B	The Fire PRA shall perform a plant partitioning analysis to identify and define the physical analysis units to be considered in the Fire PRA.	In most part, VC Summer defined the physical analysis units and covered all locations within the global analysis boundary. There are two Suggestion F&Os requiring clarification/documentation of providing justification for crediting non-rated barrier or spatial separation in some fire zones/sub-zones.
HLR-PP-C	The Fire PRA shall document the results of the plant partitioning analysis in a manner that facilitates Fire PRA applications, upgrades, and peer review.	Based on the review of Attachment 1 to DC00340-001 and written update from VC Summer on August 17. 2010, VC Summer properly documented the results of the plant partitioning, covered all relevant location, and provided the justification for exclusion of some of locations from the analysis boundary.

Note: Table V-4 is based only on the original peer review.

Table V-5 PRA Technical Element Summary: Equipment Selection (ES)

High Level Requirement Number	Summary of High Level Requirement	Equipment Selection Summary (by High Level Requirements)
HLR-ES-A	The Fire PRA shall identify equipment whose failure, including spurious operation, caused by an initiating fire will contribute to or otherwise cause an initiating event.	The Fire PRA for VC Summer addressed the requirements of this HLR and identified the applicable fire induced initiating events for inclusion in the Fire PRA. The effort included the consideration of multiple fire induced spurious operations that could lead to an initiating event.
HLR-ES-B	The Fire PRA shall identify equipment whose failure including spurious operation would adversely affect the operability/functionality of that portion of the plant design to be credited in the Fire PRA.	The Fire PRA for VC Summer addressed the requirements of this HLR and identified the scope of equipment to be credited in the Fire PRA. The effort included the consideration of fire induced multiple spurious operations. The review found that additional technical work is required in this area.
HLR-ES-C	The Fire PRA shall identify instrumentation whose failure including spurious operation would impact the reliability of operator actions associated with that portion of the plant design to be credited in the Fire	The Fire PRA for VC Summer addressed the requirements of this HLR and identified the scope of instruments that need to be included in the Fire PRA.
HLR-ES-D	The Fire PRA shall document the Fire PRA equipment selection, including that information about the equipment necessary to support the other Fire PRA tasks (e.g., equipment identification; equipment type; normal, desired, failed states of equipment; etc.) in a manner that facilitates Fire PRA applications, upgrades, and peer review.	The Fire PRA for VC Summer addressed the requirements of this HLR.

Note: Table V-5 is based only on the original peer review.

Table V-6 PRA Technical Element Summary: Cable Selection and Location (CS)

High Level Requirement Number	Summary of High Level Requirement	Cable Selection and Location Summary (by High Level Requirements)
HLR-CS-A	The Fire PRA shall identify and locate the plant cables whose failure could adversely affect credited equipment or functions included in the Fire PRA plant response model, as determined by the equipment selection process (HLR-ES-A, HLR-ES-B, and HLR-ES-C).	The Fire PRA identifies and locates the plant cables whose failure could adversely affect credited equipment or functions, as determined by the equipment selection process. The SRs related to the methodology and results were generally met, with findings on individual issues associated with treatment of high consequence equipment based on cable type, treatment of proper polarity hot shorts, and documentation of methods associated with an exclusionary analysis for crediting 230KV power. A suggestion was also made to review and update documentation for cable selection for an individual component. A best practice was identified for the methodology and documentation of cable selection to support Fire PRA applications.
HLR-CS-B	The Fire PRA shall (a) perform a review for additional circuits that are either required to support a credited circuit (i.e., per HLR-CS-A) or whose failure could adversely affect a credited circuit and (b) identify any additional equipment and cables related to these additional circuits consistent with the other equipment and cable selection requirements of this standard.	A gap assessment had recently been performed to address this topic. While the scope of the Gap assessment was viewed to be comprehensive, the work necessary to resolve the open issues and incorporate the results into the Fire PRA has not been performed. A finding was written to address completion of the Open Items.
HLR-CS-C	The Fire PRA shall document the cable selection and location process and results in a manner that facilitates Fire PRA applications, upgrades, and peer review. The Fire PRA shall document the cable selection and location process and results in a manner that facilitates Fire PRA applications, upgrades, and peer review.	The Fire PRA documents the cable selection and location process and results in a manner that facilitates Fire PRA applications, upgrades, and peer review. The SRs were generally met, with a finding associated with documentation of common power supply/enclosure results, once the work is completed. A suggestion on documentation of cable location methodology and routing was also made.

Note: Table V-6 is based only on the original peer review.

Table V-7 PRA Technical Element Summary: Fire PRA Plant Response Model (PRM)

High Level Requirement Number	Summary of High Level Requirement	Plant Response Model Summary (by High Level Requirements)
HLR-PRM-A	The Fire PRA shall include the Fire PRA plant response model capable of supporting the HLR requirements of FQ.	The Fire PRA model generally addresses the requirements to support FQ. There are some items where more technical rigor is needed for closure.
HLR-PRM-B	The Fire PRA plant response model shall include fire-induced initiating events, both fire-induced and random failures of equipment, fire-specific as well as non-fire-related human failures associated with safe shutdown, accident progression events (e.g., containment failure modes), and the supporting probability data (including uncertainty) based on the SRs provided under this HLR that parallel, as appropriate, Section 2 of this Standard, for Internal Events PRA.	The general structure and function capability of modeling follows the intent of the requirements of Section 2 of the Standard, and should support applications after identified items are addressed.
HLR-PRM-C	The Fire PRA shall document the Fire PRA plant response model in a manner that facilitates Fire PRA applications, upgrades, and peer review.	The level and manner of documentation was adequate to support review and application of the products.

Note: Table V-7 is based on the original as well as follow-on peer review which included only one SR associated with the technical element PRM, namely PRM-B5. However, there were no changes made to the Table based on the follow-on peer review.

Table V-8 PRA Technical Element Summary: Fire Scenario Selection and Analysis (FSS)

High Level Requirement Number	Summary of High Level Requirement	Fire Scenario Selection and Analysis Summary (by High Level Requirements)
HLR-FSS-A	The Fire PRA shall select one or more combinations of an ignition source and damage target sets to represent the fire scenarios for each unscreened physical analysis unit upon which estimation of the risk contribution (CDF and LERF) of the physical analysis unit will be based.	The selection of treatment of ignition sources and targets in the development of fire scenarios is acceptable. The credit taken for suppression systems in the scenario development needs to be better described and calculations need to be completed.
HLR-FSS-B	The Fire PRA shall include an analysis of potential fire scenarios leading to the Main Control Room (MCR) abandonment.	Fire scenarios leading to the MCR abandonment were modeled based on the review of documents provided by VC Summer PRA team. However, the contents of documents are different from the quantification results.
HLR-FSS-C	The Fire PRA shall characterize the factors that will influence the timing and extent of fire damage for each combination of an ignition source and damage target sets selected per HLR-FSS-A.	The Fire PRA characterizes ignition sources and damage target sets largely in terms of generic guidance information and data provided in NUREG/CR-6850. As a consequence, Supporting Requirements are met at Capability Category II or higher for all SRs. One finding was developed based on the issue of dependencies between automatic and manual suppression and the general reliance on the fire brigade to resolve these dependencies.
HLR-FSS-D	The Fire PRA shall quantify the likelihood of risk-relevant consequences for each combination of an ignition source and damage target sets selected per HLR-FSS-A.	The quantification of the likelihood of risk-relevant combinations of ignition sources and target sets is acceptable. The risk impact of single physical analysis unites (fire zones) is higher than expected for a completed Fire PRA.
HLR-FSS-E	The parameter estimates used in fire modeling shall be based on relevant generic industry and plant-specific information. Where feasible, generic and plant-specific evidence shall be integrated using acceptable methods to obtain plant-specific parameter estimates. Each parameter estimate shall be accompanied by a characterization of the uncertainty.	The parameter estimates used in fire modeling are based on relevant generic industry and plant-specific information. Plant geometry information was obtained from plant-specific documents. Parameters for fire modeling were obtained from generic industry data. The SR relating to the parameter uncertainty was judged to be met at CC-I. However, this high level requirement is judged to be satisfied.

Table V-8 PRA Technical Element Summary: Fire Scenario Selection and Analysis (FSS)

High Level Requirement Number	Summary of High Level Requirement	Fire Scenario Selection and Analysis Summary (by High Level Requirements)
HLR-FSS-F	The Fire PRA shall search for and analyze risk-relevant scenarios with the potential for causing fire-induced failure of exposed structural steel.	The SRs relating to analysis of fire-induced failure of exposed structural steel are judged to be met. This HLR is therefore judged to be satisfied.
HLR-FSS-G	The Fire PRA shall evaluate the risk contribution of multi-compartment fire scenarios.	The Fire PRA evaluates the risk contribution of multi-compartment fire scenarios through a three-step screening process followed by a risk-based evaluation of unscreened compartments. The three-step screening process includes: 1) Qualitative screening based on the presence of no fire PRA targets in the exposed compartment; 2) Screening based on risk contribution; and 3) Screening based on fire modeling. Two findings were developed for the SRs associated with this HLR. The first relates to accuracy of the current documentation associated with this HLR and the second relates to the damage temperature used for screening based on fire modeling.
HLR-FSS-H	The Fire PRA shall document the results of the fire scenario and fire modeling analyses including supporting information for scenario selection, underlying assumptions, scenario descriptions, and the conclusions of the quantitative analysis, in a manner that facilitates Fire PRA applications, upgrades, and peer review.	The SRs associated with this HLR are generally met based on the provision of adequate and appropriate documentation. SR H5 received a Capability Category I rating because no uncertainty estimates are provided with fire modeling output parameters. A finding was developed noting that the uncertainty estimates included in the NUREG 1824 V&V report could be used to address this requirement.

Note: Table V-8 is based solely on the follow-on peer review. Information from the original peer review has been deleted from the Table.

Table V-9 PRA Technical Element Summary: Ignition Frequency (IGN)

High Level Requirement Number	Summary of High Level Requirement	Ignition Frequency Summary (by High Level Requirements)
HLR-IGN-A	The Fire PRA shall develop fire ignition frequencies for every physical analysis unit that has not been qualitatively screened.	The Fire PRA develops the fire ignition frequencies for all physical analysis units based on the generic fire ignition frequency data (EPRI TR 1016735), fixed initiator counts from plant walk downs, and transient initiators with appropriate weighting factors.
HLR-IGN-B	The Fire PRA shall document the fire frequency estimation in a manner that facilitates Fire PRA applications, upgrades, and peer review.	The frequency estimations are documented in the Fire Ignition Frequency analysis report (Attachment 5 to DC00340 - 001), with additional attachments. The data sheets for each fire compartments are included (Attachment II) which document the fixed source counts and the transient weighting factors used.

Note: Table V-9 is based only on the original peer review.

Table V-10 PRA Technical Element Summary: Circuit Failures (CF)

High Level Requirement Number	Summary of High Level Requirement	Circuit Failure Analysis Summary (by High Level Requirements)
HLR-CF-A	The Fire PRA shall determine the applicable conditional probability of the cable and circuit failure mode(s) that would cause equipment functional failure and/or undesired spurious operation based on the credited function of the equipment in the Fire PRA.	The cable failure likelihood values assigned in calculation do not always reflect Section 2.0 "Scope/Methodology" (which is based on NUREG/CR-6850, Vol. 2, Chapter 10) and the rationale for using different values is not documented in the calculation. A finding was written to address this condition. A finding associated with treatment of uncertainty was written since that task had not yet been performed.
HLR-CF-B	The Fire PRA shall document the development of the elements above in a manner that facilitates Fire PRA applications, upgrades, and peer review.	The Fire PRA calculation documents the development of the elements above in a manner that facilitates Fire PRA applications, upgrades, and peer review.

Note: Table V-10 is based on the original as well as follow-on peer review which included only one SR associated with the technical element CF, namely CF-A2. However, no changes were made to this Table based on the follow-on peer review.

Table V-11 PRA Technical Element Summary: Human Reliability Analysis (HRA)		
High Level Requirement Number	**Summary of High Level Requirement**	**Human Reliability Analysis Summary (by High Level Requirements)**
HLR-HRA-A	The Fire PRA shall identify human actions relevant to the sequences in the Fire PRA plant response model.	This high level requirement for identifying human actions relevant to the sequences in the Fire PRA plant response model was complete for the most part, however, there are some items where more work is needed to meet all of the SR requirements.
HLR-HRA-B	The Fire PRA shall include events where appropriate that represent the impacts of incorrect human responses associated with the identified human actions.	This high level requirement for including events appropriately in the Fire PRA that address incorrect human responses associated with the identified human actions in the Fire PRA plant response model was complete for the most part, however, there are some items where more work is needed to meet all of the SR requirement
HLR-HRA-C	The Fire PRA shall quantify HEPs (Human Error Probabilities) associated with the incorrect responses accounting for the plant-specific and scenario-specific influences on human performance, particularly including the effects of fires.	This high level requirement for quantifying HEPs associated with the incorrect responses accounting for the plant-specific and scenario-specific influences on human performance, particularly including the effects of fires is met.
HLR-HRA-D	The Fire PRA shall include recovery actions only if it has been demonstrated that the action is plausible and feasible for those scenarios to which it applies, particularly accounting for the effects of fires.	This high level requirement for including recovery actions only if it has been demonstrated that the action is plausible and feasible has been met.
HLR-HRA-E	The Fire PRA shall document the HRA, including the unique fire-related influences of the analysis, in a manner that facilitates Fire PRA applications, upgrades, and peer review.	This high level requirement for documenting the HRA, including the unique fire-related influences of the analysis, in a manner that facilitates Fire PRA applications, upgrades, and peer review has been met.

Note: Table V-11 is based on the original as well as follow-on peer review which included two SRs associated with the technical element HRA, namely HRA-A2 and B2. However, no changes were made to this Table based on the follow-on peer review.

Table V-12 PRA Technical Element Summary: Seismic Fire Interaction (SF)

High Level Requirement Number	Summary of High Level Requirement	Seismic/Fire Interaction Summary (by High Level Requirements)
HLR-SF-A	The Fire PRA shall include a qualitative assessment of potential seismic/fire interaction issues in the Fire PRA.	VC Summer performed a walkdown and adequately documented identification and qualitative assessment of seismically induced fire ignition sources and scenarios. VC Summer self-identified a procedural deficiency covering fire brigade training and fire brigade responses to a seismically induced fire and spurious operation of fire suppression systems.
HLR-SF-B	The Fire PRA shall document the results of the seismic/fire interaction assessment in a manner that facilitates Fire PRA applications, upgrades, and peer review.	The Fire PRA did document the results of the seismic/fire interaction assessment in a manner that facilitates Fire PRA applications, upgrades, and peer review.

Note: Table V-12 is based only on the original peer review.

Table V-13 PRA Technical Element Summary: Fire Risk Quantification (FQ)

High Level Requirement Number	Summary of High Level Requirement	Fire Risk Quantification Summary (by High Level Requirements)
HLR-FQ-A	Quantification of the Fire PRA shall quantify the fire-induced CDF.	The quantification process was able to quantify a CDF from the inputs.
HLR-FQ-B	The fire-induced CDF quantification shall use appropriate models and codes and shall account for method specific limitations and features.	The models and codes used to quantify CDF are appropriate and the limitations are understood.
HLR-FQ-C	Model quantification shall determine that all identified dependencies are addressed appropriately.	The quantification process is capable of addressing dependencies.
HLR-FQ-D	The frequency of different containment failure modes leading to a fire-induced large early release shall be quantified and aggregated thus determining the fire-induced LERF.	The quantification process includes the ability to determine fire induced LERF.
HLR-FQ-E	The fire-induced CDF and LERF quantification results shall be reviewed, and significant contributors to CDF and LERF, such as fires and their corresponding plant initiating events, fire locations, accident sequences, basic events (equipment unavailability and human failure events), plant damage states, containment challenges, and failure modes, shall be identified. The results shall be traceable to the inputs and assumptions made in the Fire PRA.	The associated SR was judged to be not met because the importance of the basic events had not been reviewed adequately.
HLR-FQ-F	The CDF and LERF analyses shall be documented consistent with the applicable SRs.	The level and manner of the documentation for this element is consistent with the reviewed SRs.

Note: Table V-13 is based on the original as well as follow-on peer review which included only one SR associated with the technical element FQ, namely FQ-E1. The assessment for FQ-E is based on the follow-on peer review.

Table V-14 PRA Technical Element Summary: Uncertainty and Sensitivity (UNC)

High Level Requirement Number	Summary of High Level Requirement	Uncertainty and Sensitivity Analysis Summary (by High Level Requirements)
HLR-UNC-A	The Fire PRA shall identify sources of CDF and LERF uncertainties and related assumptions and modeling approximations. These uncertainties shall be characterized such that their potential impacts on the results are understood.	The sources of CDF and LERF uncertainties are identified as part of individual tasks. A series of sensitivity studies have been conducted to study the impact of change in input parameter values on the CDF. A sensitivity study has not been performed to determine the impact on LERF. One of the two SRs was judged to be not met and a number of F&Os have been identified.

Note: Table V-14 is based only on the follow-on peer review.

Table V-15 PRA Technical Element Summary: Configuration Control (MU)

High Level Requirement Number	Summary of High Level Requirement	Configuration Control Summary (by High Level Requirements)
HLR-MU-A	The PRA configuration control process shall include monitoring of PRA inputs and collection of new information.	All SRs are met with one Suggestion F&O to include more specifics for fire MU attributes.
HLR- MU-B	The PRA configuration control process shall include maintenance and upgrades to the PRA to be consistent with the as-built, as-operated plant.	All SRs are met with one Suggestion F&O to include more specifics for fire MU attributes (same F&O as in HLR-MU-A).
HLR- MU-C	The PRA configuration control process shall include evaluation of the cumulative impact of pending changes on risk applications.	All SRs are met with one Suggestion F&O to include more specifics for fire MU attributes (same F&O as in HLR-MU-A).
HLR- MU-D	The PRA configuration control process shall include a process for maintaining control of computer codes used to support PRA quantification.	All SRs are met.
HLR- MU-E	The PRA configuration control process shall be documented.	All SRs are met.

Note: Table V-15 is based only on the original peer review.

SR	Capability Category	Active F&Os
PP-A1	Met	
PP-B1	Met	
PP-B2	CC II/III	PP-B2-01
PP-B3	Not Met	PP-B2-01
PP-B4	Met	PP-B2-01
PP-B5	CC II/III	
PP-B6	Met	PP-B6-01
PP-B7	Met	
PP-C1	Met	
PP-C2	Met	
PP-C3	Met	PP-B2-01
PP-C4	Met	
ES-A1	Met	ES-A1-01
ES-A2	Met	
ES-A3	Met	
ES-A4	CC III	ES-A4-01
ES-A5	CC II	ES-A6-01
ES-A6	CC I	ES-A6-01
ES-B1	Not Met	ES-B1-01, ES-B1-02, ES-B1-03
ES-B2	Not Met	ES-B1-01, ES-B1-03, ES-A6-01
ES-B3	Not Met	ES-B1-01, ES-B1-03, ES-B3-01
ES-B4	Met	ES-B4-01
ES-B5	Met	
ES-C1	Met	
ES-C2	CC II	
ES-D1	Met	ES-D1-01
CS-A1	Met	ES-D1-01, CS-C2-01
CS-A2	CC II	CS-A2-01, CS-C2-01
CS-A3	Met	ES-B4-01
CS-A4	Met	ES-B4-01
CS-A5	Met	
CS-A6	Met	
CS-A7	NA	
CS-A8	Not Met	CS-A8-01

Table V-16 Capability Categories of Supporting Requirements

Table V-16 Capability Categories of Supporting Requirements

SR	Capability Category	Active F&Os
CS-A9	Met	CS-A9-01
CS-A10	CC III	CS-A10-01
CS-A11	NA	
CS-B1	Not Met	CS-B1-01
CS-C1	Met	CS-C1-01, CS-C2-01
CS-C2	Met	CS-C2-01, CS-C1-01
CS-C3	NA	
CS-C4	Not Met	CS-B1-01
QLS-A1	NA	QLS Not Performed
QLS-A2	NA	QLS Not Performed
QLS-A3	NA	QLS Not Performed
QLS-A4	NA	QLS Not Performed
QLS-B1	NA	QLS Not Performed
QLS-B2	NA	QLS Not Performed
QLS-B3	NA	QLS Not Performed
PRM-A1	Met	
PRM-A2	Met	
PRM-A3	Met	
PRM-A4	Met	ES-B4-01, PRM-A4-01, PRM-A4-02, PRM-A4-03, PRM-A4-04, PRM-A4-05
PRM-B1	Met	
PRM-B2	Met	
PRM-B3	Met	ES-A1-01
PRM-B4	NA	
PRM-B5*	Met	PRM-B5-01
PRM-B6	NA	
PRM-B7	Met	PRM-B7-01
PRM-B8	NA	
PRM-B9	Met	PRM-B9-01, PRM-B9-02
PRM-B10	Met	ES-B1-03
PRM-B11	Met	
PRM-B12	Met	
PRM-B13	Met	
PRM-B14	Met	ES-B3-01

Table V-16 Capability Categories of Supporting Requirements

SR	Capability Category	Active F&Os
PRM-B15	NA	
PRM-C1	Met	
FSS-A1*	Met	
FSS-A2*	Met	
FSS-A3*	Met	
FSS-A4*	Met	FSS-A4-01; FSS-A4-02
FSS-A5*	CC I/II	
FSS-A6*	CC I/II	
FSS-B1*	Met	
FSS-B2*	CC I	FSS-B2-01
FSS-C1*	CC II	
FSS-C2*	CC II/III	
FSS-C3*	CC II/III	
FSS-C4*	CC II	
FSS-C5*	CC I/II	
FSS-C6*	CC I/II	
FSS-C7*	Met	FSS-C7-01
FSS-C8*	Met	
FSS-D1*	Met	
FSS-D2*	Met	
FSS-D3*	CC II	FSS-D3-01
FSS-D4*	Met	
FSS-D5*	CC I/II	
FSS-D6*	Met	
FSS-D7*	CC I	FSS-D7-01
FSS-D8*	Not Met	FSS-D8-01
FSS-D9*	CC II/III	FSS-D9-01
FSS-D10*	CC II/III	
FSS-D11*	Met	
FSS-E1*	Met	
FSS-E2*	Not Applicable	
FSS-E3*	CC I	UNC-A2-01
FSS-E4*	Not Applicable	
FSS-F1*	CC I/II	

Table V-16 Capability Categories of Supporting Requirements		
SR	Capability Category	Active F&Os
FSS-F2*	CC II/III	FSS-F2-01
FSS-F3*	CC II/III	FSS-F3-01
FSS-G1*	Met	FSS-G1-01
FSS-G2*	Met	FSS-G2-01
FSS-G3*	Met	
FSS-G4*	CC II	
FSS-G5*	CC II/III	
FSS-G6*	CC II/III	
FSS-H1*	Met	
FSS-H2*	Met	
FSS-H3*	Met	
FSS-H4*	Met	
FSS-H5*	CC I	FSS-H5-01
FSS-H6*	Met	
FSS-H7*	Met	
FSS-H8*	Met	
FSS-H9*	Met	FSS-H9-01
FSS-H10*	Met	
IGN-A1	Met	IGN-A1-01
IGN-A2	NA	
IGN-A3	NA	
IGN-A4	CC II	
IGN-A5	Met	IGN-A5-01
IGN-A6	NA	
IGN-A7	Met	IGN-A7-01
IGN-A8	CC I/II	
IGN-A9	Met	
IGN-A10	CC III	
IGN-B1	Met	
IGN-B2	Met	
IGN-B3	Met	
IGN-B4	NA	
IGN-B5	Not Met	IGN-B5-01
QNS-A1	Met	

Table V-16 Capability Categories of Supporting Requirements

SR	Capability Category	Active F&Os
QNS-B1	Met	
QNS-B2	Met	
QNS-C1	CC II	QNS-C1-01
QNS-D1	Met	
QNS-D2	Met	
CF-A1	Not Met	CF-A1-01, CF-A1-02
CF-A2*	Met	
CF-B1	Met	
HRA-A1	Met	
HRA-A2*	Met	
HRA-A3	CC II	HRA-A3-01, HRA-A3-02
HRA-A4	CC II/III	
HRA-B1	CC III	
HRA-B2*	Met	
HRA-B3	CC III	HRA-B3-01
HRA-B4	CC II	HRA-B4-01, HRA-B4-02
HRA-C1	CC II	HRA-C1-01, HRA-C1-02
HRA-D1	CC III	
HRA-D2	Not Met	HRA-D2-01
HRA-E1	Met	
SF-A1	Met	
SF-A2	Met	
SF-A3	Met	
SF-A4	Not Met	SF-A4-01
SF-A5	Not Met	SF-A4-01
SF-B1	Met	
FQ-A1	Met	
FQ-A2	Met	
FQ-A3	Met	
FQ-A4	Met	FQ-A4-01
FQ-B1	Met	FQ-B1-01
FQ-C1	Met	
FQ-D1	Met	
FQ-E1*	Not Met	FQ-E1-01

Table V-16 Capability Categories of Supporting Requirements

SR	Capability Category	Active F&Os
FQ-F1	Met	
FQ-F2	NA	
UNC-A1*	Met	
UNC-A2*	Not Met	UNC-A2-01; UNC-A2-02; UNC-A2-03
MU-A1	Met	MU-A1-01
MU-A2	Not Met	MU-A1-01
MU-B1	Met	MU-A1-01
MU-B2	Met	MU-A1-01
MU-B3	Met	
MU-B4	Met	
MU-C1	Met	MU-A1-01
MU-D1	Met	
MU-E1	Met	

* Information based on follow-on peer review.

Note: Table V-16 is based on the original as well as follow-on peer review which included 57 SRs. A few SRs associated with the technical element FSS were in the scope of both the original and follow-on peer review. The information in this Table reflects only those from the follow-on peer review.

Table V-17 Summary of Facts and Observations

Element	F&Os*			
	Findings	Suggestions	Best Practice	Total by Element
PP	-	2	-	2
ES	7	2	-	9
CS	3	3	1	7
QLS**	-	-	-	-
PRM	7	2	-	9
FSS	11	3	-	14
IGN	2	2	-	4
QNS	-	1	-	1
CF	2	-	-	2
HRA	5	2	1	8
SF	1	-	-	1
FQ	1	2	-	3
UNC	3	-	-	3
MU	-	1	-	1
TOTAL	42	20	2	64

* Table V-17 is based on the original as well as follow-on peer review.

**VCSNS did not perform Qualitative Screening.

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
ES-A1-01	ES-A1	Finding	PRM-B3	The identification of components whose fire induced failure could cause an initiating event did not include a review or discussion of screened initiating events from the internal events PRA model. The basis for screening of these initiating events may not be valid given a postulated fire event. The consequences of a fire could include events that are more challenging than a simple trip (%TT). One or more of the screened initiating events could be meaningful given a fire and may represent a non-insignificant risk contribution that would be inappropriately excluded. Perform a review of the screened initiating events in the internal events PRA and either include in the Fire PRA or justify their continued exclusion. If additional components are identified, then include them in the scope of the Fire PRA and ensure that the requirements of ES-A2 are also met. (**Note:** This F&O is based on the original peer review).	Reviewed the screened internal events initiating events and document their applicability to FPRA. The new generic fire initiator allows the model to pick the appropriate internal events initiator, so this is no longer an issue. The new method for initiator selection is described in the Task 5.5 report.
ES-A4-01	ES-A4	Finding		The spurious operation of the Pressurizer normal spray valve(s) PCV-444C, D with RCP(s) running could result in RCS depressurization and challenge RCS pressure control, would cause an SI actuation, etc. These components are included in the Component-BE table in the FRANX database, but the corresponding basic event PCV-444C-FIRE could not be found in the CAFTA fault tree and it is not clear if the event is being treated via as a spurious event and handled via the FRANX "data replacement" process. There is no corresponding component/function state in the cable selection calculation. Failure to address the RCS pressure reduction transient could mask the impact of these failures on RCS pressure reduction, subsequent Rx Trip/Safety Injection, and resultant plant impact. Re-address this MSO scenario and the rationale for screening. Either model the impact and correlate the plant impact to an appropriate initiating event. (**Note:** This F&O is based on the original peer review).	MSO-35 scenario has been included in the CAFTA model. Task 5.5 was revised to reference the model and the MSO modeling.

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
ES-B1-01	ES-B1	Finding	ES-B3	The development of the Fire PRA is very data intensive and much of the work associated with the quantification process is entirely dependent of the validity of data linkages in the various databases. The key analysis databases are PC-CKS and FRANX. A review of the Fire PRA found numerous data inconsistencies and linkage issues between these two files. In addition, it appears that other key data relationships that are critical to the analysis do not exist in these two databases - suggesting that there are other key sources of data that are needed. The review of the key databases found instances where data from PC-CKS and FRANX are not properly coordinated. These are generally reflected in the various tables ultimately referring to PRA model basic events that do not exist. As a consequence, while the developed data (equipment and cable listings) indicate that certain fire induced failures are treated in the Fire PRA, the data inconsistencies would result in these elements not being propagated into the actual quantification of the PRA model. Another very key concern is the treatment of fire induced spurious replacements in FRANX. Based on discussions and a review of FRANX, it appears that this data is entirely developed manually - not via a database query. In addition, the resulting table and associated documentation does not retain the data linkages to PC-CKS. Several errors were identified in the development of this table in FRANX - again causes errors in the propagation of fire induced effects. It is suggested that a comprehensive confirmation of data integrity and consistency be performed and that any required intermediate translation tables, data relationships, or queries be identified and integrated into the project documentation and analysis files. (**Note:** This F&O is based on the original peer review).	See response to ES-B1-03.
ES-B1-03	ES-B1	Finding	ES-B3, PRM-	The treatment (crediting) of components in the Fire PRA	Discussed and documented the

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
			B10	depends largely on the manner in which individual PRA model basic events are linked to spatial data via FRANX and PC-CKS. A review of the data found that out of about 2,800 PRA model basic events, less than 900 are mapped to spatial data and used to control the quantification process. The remaining unmapped PRA model basic events include many items that represent component failure modes that could be induced by a fire. While it is possible that all of these have been effectively subsumed by the mapped basic events, in the absence of some documentation or explicit treatment, it is not possible to ascertain that these unmapped events have not inadvertently been credited in the quantification. The potential that random basic events could be included in the Fire PRA quantification when they should have otherwise been set to TRUE could result in invalid results (low CCDP). An effort should be undertaken and documented to demonstrate that the Fire PRA only relies on those functional features of the VC Summer plant for which spatial equipment and cable location data is developed. (**Note:** This F&O is based on the original peer review).	mapping process, i.e. functional states that are mapped and those that are not mapped. Go through unmapped BEs in the .rr file and add mappings and/or disposition in .rr file and C_to_BE table. Disposition every basic event in the model as to whether or not it is mapped to a functional state or not. Review the mapping to confirm we still believe it is appropriate. Review all the "-FIRE" BEs that were added and decide if it might be cleaner to map to an existing BE from the internal events model. Add a comment column to the .rr file BE data table called "FPRA comments" and in that column stated whether a BE is mapped or not and, if not, why not. - This was completed and the .rr file now has a FPRA Disposition column and the C_to_BE has notes for any non-normal mappings.
ES-B3-01	ES-B3	Finding	PRM-B14	(The development of the Fire PRA was based on the internal events PRA model LERF structure. This model included credit for screened penetrations using a 2" or smaller criteria. The Fire PRA development did not include any review or assessment to examine this treatment to address fire specific considerations. For example, valves that would fail close on loss of power or air are not addressed for the much higher spurious actuation probability that would apply given a fire event. The LERF treatment is based on the internal events PRA model which includes a screening criteria for lines 2" and smaller. As a consequence, there are multiple 2" and 1.5" lines that are excluded. These lines include the 2" letdown lines. As	The containment isolation penetrations that were screened out in the internal events IPE and PRA but should be considered in the Fire PRA have been identified. Details on the containment isolation penetrations are included in the Task 5.5 report in Step 13.

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				an example, failure of the letdown line is identified as a new sequence to be added for the Fire PRA. This adds a new CD sequence but the same flow path is not included in the LERF model. As a result, this CD sequence which is a concurrent bypass event is not included in the Fire PRA model. As a consequence, the LERF model is incomplete. A review of the screened penetrations performed for the internal events model should be performed to ensure those screened penetrations are included in the Fire PRA as necessary. It is anticipated that some altered screening criteria will be required. That screening criteria should incorporate factors that are specific to fire if conditional probabilities of occurrence given fire induced damage are used. In general, the screening methodology for the Fire PRA must recognize the relatively high likelihood of fire induced failures with consideration of spurious and multiple spurious events. **Note:** This F&O is based on the original peer review).	
ES-B4-01	ES-B4	Finding	ES-A2, PRM-A4, CS-A4	CS-A3-01 - Cable selection for RCP tripping function (e.g., XPP00030A:On:Off function code) includes its dc control power supply (e.g., DPN1HB2) as a required power supply, but it does not appear to be included in the CAFTA model as necessary to trip the pumps. Gate G091 (MSO4-RCP A, B, OR C FAILS TO TRIP) does not appear to have a dependency on control power in the CAFTA model to perform the trip function. Failure to address the power supply dependency in the CAFTA model could mask failures associated with the upstream power supplies (due to fire) that could prevent the RCP trip function. Fire scenarios could adversely impact the RCP trip capability, but the quantification of fire risk would not recognize the failure. Include the RCP trip upstream power supplies in logic gates in the CAFTA model, consistent with the identification of required power supplies, consistent with Technical Report TR07800-009, NFPA 805 AND FIRE PRA CIRCUIT ANALYSIS, TASK	The CAFTA FPRA model has been revised to include the power dependency for DPN1HB2 (GATE G091).

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				4.4, Rev. A, dated 8/10/10, Attachment B. (**Note:** This F&O is based on the original peer review).	
ES-D1-01	ES-D1	Finding	CS-A1	(The technical issues that have been identified for HLR-ES indicate a need for enhancements to the Project Instructions and/or task documentation. There are a number of key process steps in the data development that are not described or discussed in the related Task Instruction or task documentation. These process steps include the manner in which the data is obtained and process to develop the spurious substitution table in FRANX, the pre-processing of the analysis data for the purposes of identifying the need to specify a non-%TT initiator, and an overall process or methodology for ensuring data integrity. The overall analysis is heavily dependent on automated data processing using a variety of data sources. Loss of data integrity between these data sources, failure to address/implement certain key steps in the analysis process, and the lack of a process or methodology for maintaining data integrity can easily result in corruption of the analysis data. Such corruption would lead to invalid results that may not be obvious. The Project Instruction and/or Task report should be enhanced to ensure that required process steps and data integrity checks are described. **Note:** This F&O is based on the original peer review).	FPRA notebooks were revised as follows: 1. Describe the spurious substitution table in FRANX in Task 5.5 report. 2. New induced-initiator modeling using the generic %FIRE initiator was added to the Task 5.5 report. Necessary changes have been made in the model. See response to PRM-A4-01 3. Describe data integrity checks in task 5.5 report.
CS-A8-01	CS-A8	Finding		Cable selection is based on the Fire PRA component list that is maintained in database PC-CKS and is documented in Technical Report TR07800-009, NFPA 805 AND FIRE PRA CIRCUIT ANALYSIS, TASK 4.4, Rev. A, dated 8/10/10. Attachment B Circuit Analysis Worksheets contains the detailed results of the cable selection for cables whose fire-induced failure could adversely affect the Fire PRA components and functions (printout from PC-CKS). Valves 8701A/B and 8702A/B are identified in Attachment B to	Kerite cable testing. Discuss FAQ 08-0053. Provide documentation for ISLOCA in ES notebook Task 5.2

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				TR07800-009 as High Consequence Equipment. The Fire PRA attributes for these valves state: "MSO scenario 16 - ISLOCA. Spurious opening of RHR suction (two valves in series) can cause ISLOCA. Breakers are locked open for all valves." The *Circuit Analysis Comments for these valves state (typ.)* " Power Cables RHC1A and RHC2A are thermoset cables, therefore they are not required for three phase proper polarity hot shorts." 4.5.2.1 of TR07800-009 states: "Case 2: Ungrounded AC system or thermoplastic-insulated cable The evaluation of ungrounded systems and thermoplastic-insulated cable is less certain than the evaluation for Case 1 due to the scarcity of data. Nonetheless, with an understanding of the general principles and phenomena involved, it can be reasoned that the failure mode has a low probability, but not as low as that for grounded systems with thermoset cable. Accordingly, for these cases, three-phase proper polarity hot shorts are considered for any components identified as Fire PRA High Consequence Equipment. **Note:** VCS utilizes Kerite-FR insulated cable throughout the plant. The exhibited fire-induced failure characteristics of Kerite-FR are ambiguous with respect to classification as either thermoset or thermoplastic insulation. Some demonstrated characteristics are indicative of thermoset insulation, while others are representative of thermoplastic insulation. For the purposes of this analysis the Kerite-FR insulation is conservatively treated as thermoplastic insulation. This issue is not expected to be risk significant due to the low likelihood of occurrence. However the treatment in NUREG/CR-6850 of high consequence equipment is different depending upon the plant configuration. Complete identified Open Item 1 in Attachment C to TR07800-	

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				009 and address Kerite cable with respect to treatment of valves 8701A/B and 8702A/B. Depending upon the results of the industry fire testing, update the Fire PRA and associated documentation as necessary. (**Note:** This F&O is based on the original peer review).	
CS-A10-01	CS-A10	Finding		Several issues were identified with the exclusionary credit taken for 230 KV power in select areas. 1. 230KV power is relied upon in the Fire PRA in selected zones based on exclusionary analysis. FRANX data depicts credit for the 230KV power in fire zones IB16, IB17, TB04, and RB01. ATTACHMENT 4 TO DC00340-001, TASK 5.5, Revision A states that the zones crediting the 230KV power source are IB16, IB17, and TB04. 2. Various Fire PRA documents discuss the exclusionary credit taken for the 230KV power. ATTACHMENT 4 TO DC00340-001, TASK 5.5, Revision A, provides a table of affected Basic Events that are failed upon the assumed loss of 230KV. However, the detailed analysis that explains why certain zones could exclude the 230KV failure is not documented. Attachment C of TR07800-009 provides some information on cables that could affect the availability of the 7.2 kV buses, but does not explain the rationale for excluding 230 KV power from IB16, IB17, and TB04. There is no evident documentation on the process used for the exclusionary review, which cables were reviewed in the selected zones, or the rationale for exclusion. It is not clear if all cables in the affected zones were reviewed, or whether a specific set of cables routed in the zones were reviewed. The lack of documentation makes the peer review, future reviews, and program maintenance difficult. Without documented methodology and results, the adequacy cannot be verified without recreating the documentation. Provide specific documentation on the scope of the credit for	Documented exclusion of 230 kV in task report. Task Report 5.5 provides details behind the confirmation that 230KV is not affected in fire zones IB16, IB17 and TB04. Provided methods used for considering "assumed routing" and process to identify potential targets that could impact the 230kv system (i.e., cables, any basic assumptions on train, breaker coordination, support systems for 230kV, etc.)

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				the 230KV system (bounds on the equipment and cables considered), methodology (what documents/data was reviewed, limitations, assumptions), and results of the review. (**Note:** This F&O is based on the original peer review).	
CS-B1-01	CS-B1	Finding	CS-C4	Technical Report TR07800-009, NFPA 805 AND FIRE PRA CIRCUIT ANALYSIS, TASK 4.4, Rev. A, dated 8/10/10, Section 4.7 and Attachment A, Common Power Supply & Common Enclosure Associated Circuits, address this topic. Attachment A of TR07800-009 contains details of an associated circuits review. The purpose of this review is to assess existing VCSNS electrical coordination and protection calculations to determine if the calculations support NFPA 805 nuclear safety capability assessment (NSCA) and Fire PRA requirements for common power supply and common enclosure associated circuits. Criteria for the evaluation are outlined in NUREG/CR-6850 and NEI 00-01. Open Items were generated as a result of the review and are documented in Attachment D of TR07800-009. While the scope of the Gap assessment was viewed to be comprehensive, the work necessary to resolve the open issues and incorporate the results into the Fire PRA has not been performed. Therefore, Work to address the results of the gap assessment is not complete. Address the open items in n Attachment D of TR07800-009. (**Note:** This F&O is based on the original peer review).	Associated circuits evaluation for Common power supply and OC Trip Protection functions (7.2 kV Switchgear) was completed. This item will be closed upon issuance of VSCNS Technical Report TR0780-009.
PRM-A4-01	PRM-A4	Finding		In many scenarios multiple initiating events are possible. The method used to model the initiators can prevent some sequences from propagating through the model. It is not clear what the basis is for selecting the "worst" scenario initiating event. The example observed involved the treatment of consequential PORV LOCAs where multiple PORVs were only included n the medium LOCA sequence and the individual	The FPRA model has been restructured to include a generic fire initiator %FIRE (0.0) in each of the accident sequence fault trees credited in FPRA model. In addition an accident sequence identifying initiator has also been added such as MLO-

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				PORV paths were missed. Other similar cases were found. Potentially significant sequences could be missing from the results. Define the method used to select the initiator and consider restructuring the modeling to allow propagating fire impact to multiple accident sequences as appropriate. (**Note:** This F&O is based on the original peer review).	FIRE (1.0) to facilitate cutset review. Appropriate documentation will be included in Task 5.2 and 5.5 to show that for a given fire scenario, the appropriate initiator is selected (due to impacted equipment) and the related mitigation system fault tree logic is valid.
PRM-A4-02	PRM-A4	Finding		The treatment of the MSO Items 6, 7, 8 all relate to fire induced failure to isolate the Letdown flow path. The selected components include LCV-459, LCV-460, and 8149A, B, and C. These related functional-state ID from PC-CKS is linked to PRA model basic events. A review of those linked basic events and the related logic structure found that they exist only in that portion of the FT that is exercised for the loss of SW and CCW initiating events. Another example involves IFV-3551 and 3556 which are associated with MSO Items 27 and 28. In this case the linked basic events are used only in the portion of the FT that is quantified for SBO related initiators. The scope of initiators used for the Fire PRA does not include these and as a result, the fire induced consequences described in the MSO Expert Panel are functionally not incorporated into the FT. There is a potential that significant results may be missing. Validate that the MSOs are properly modeled such that the intended fire impacts are realized. (**Note:** This F&O is based on the original peer review).	The model was reviewed for MSO accuracy. The MSO 27 issue is still in the model and has been fixed, but is not reflected in the report version of the model. The updated model will be provided to the team to verify that it has been fixed.
PRM-A4-03	PRM-A4	Finding		A simplified overall assessment was performed where the "VCS Fault Tree MCR event included 7-28.caf" fault tree was modified to set all initiating events to FALSE except for %TT, %LCC1, %LSW1, %MLO-F, and %SLBO-F. The fault tree was then compressed and the database purge utility was used to remove all unused basic events. The resulting scope of basic events in the PRA model was then compared to the FRANX	See response to ES-B1-03.

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				data mapping tables for functional states and spurious replacement. It was found that there are 244 entries in the BE Mapping table that used that represent events that are not in the portion of the fault tree used for the Fire PRA. An additional 15 items in spurious substitution table have a similar situation. As a consequence, there are fire induced failures identified as requiring treatment in the Fire PRA that are effectively not included in the quantified portion of the PRA model. There is a potential that significant results may be missing. Validate that the identified events are modeled such that the expected fire impacts are realized. (**Note:** This F&O is based on the original peer review).	
PRM-A4-04	PRM-A4	Finding		Errors were noted in the modeling of MSO scenarios in the Fire PRA model. The identified errors were based on a sample review of CAFTA modeling associated with changes to the internal events model structure associated with fire (e.g., MSO modeling). This review was not a 100% review or verification. 1. The spurious closure of VCT valves on an operating charging pump (Scenario 10) does not appear to be specifically addressed in the Fire PRA (only the failure to close or spurious opening of the VCT valve(s) are modeled). BE FAMVLCV0115CFC addresses the failure to close LCV-0115, but that failure mode does not result, by itself, in impact to the charging pumps unless other failures are present. This basic event, per the FRANX table is linked to Component LCV00115C:Open:Closed. There is no LCV00115C:Open:Open, and it appears that the spurious closure of LCV00115C in the Fire PRA model (BE FAMVLCV0115CSC) is not linked in the FRANX table to any Components. 2. Letdown isolation valves LCV-459 and LCV-460 (series isolation, both of which need to remain open/spuriously open in order to fail letdown isolation). They appear in an	Errors were addressed and MSOs were reviewed for additional issues.

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				"OR" gate G-052 rather than an expected "AND" gate. 3. Gates RWST-DRAINDOWN-MSO14 and GATE217 are "AND" gates which require drain down via both A and B flow paths to challenge RWST integrity (i.e., failure of 3004B & 3005B and 3004A & 3005A). Failure of either flow path (e.g., if the gates were "OR" gates) would result in RWST drain down and subsequent impact on RWST inventory for Charging/HHSI, RHR, RB Spray, etc. The Fire PRA attributes in the Cable Selection calculation, Attachment B to TR07800-009 for XVG03004A:Closed:Closed function code states: New scenario: Multiple spurious opening (3004A AND 3005A OR 3004B AND 3005B) results in drain down of RWST. 4. The Task 5 report states: Reactor Building Spray – Spurious start of spray pump and spurious opening of spray header isolation valve [XPP-038A and XVG-3003A (A header) or XPP-038B and XVG-3003B (B header)]. **Note:** Actuation of reactor building spray due to spurious high containment building pressure is not explicitly modeled (see MSO 54d). MSO 54d discussion in the Task 5 report states "High containment pressure from 2 out of 3 coincidence of reactor building pressure bistables due to spurious signals from 2 out of 3 pressure instruments (IPT-951, -952, and -953) can result in spurious actuation of the reactor building spray system due to actuation of the Phase "A" Containment Isolation signal and Spray Actuation signal. Based on the circuit analysis in PC-CKS, the equipment dependency for the reactor building pressure instrumentation has been established to ensure the effects of fire induced mal-operation of the spray pumps and valves is captured. Therefore, no additional fault tree modeling is required." The modeling in the CAFTA fault tree for the Rx Building pressure transmitters is modeled in PRA (e.g., under gate SPRA_PSR_1), but they only appear to be addressed to	

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				support the operation of the RB spray system (not the potential spurious operation of the RB spray system). This appears to be a modeling error. 5. Valve 8106 is a common charging pump minimum flow valve that, if closed, has the potential to fail operating charging pump(s). Procedures that provide power lockout to valve during normal operation, but the circuit selection in Attachment B of TR07800-009 shows some cables that could spuriously close the valve without mention of the power lockout. It is unclear if fire-induced control power faults on the power lockout circuit and valve control scheme could potentially cause 8106 to close. It appears there are cables in the circuit analysis that say the valve could spuriously close, but that failure is not considered in the Fire PRA. Significance: 1. Spurious closure of either VCT outlet valve could result in damage to one or more operating charging pumps (e.g., an operating pump or multiple pumps depending on other fire failures such as spurious starts/SI signals), which could create challenges to RCP seal cooling or makeup capability to combat RCS losses. This is an area of NRC interest and could result in short term consequences more severe than failure to isolate the VCT upon swap over to the RWST. 2. Incorrect modeling of letdown isolation could lead to overly conservative results. 3-4. Incorrect modeling of RWST drain down could mask fire failures that make the RWST unavailable as an inventory source. 5. Incorrect modeling of charging pump miniflow could mask fire failures that make the charging pumps unavailable as a source of seal injection/RCS makeup. Recommendation: Correct the identified modeling errors in the CAFTA model.	

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				Note that the review was a sample review, and due to the large number identified discrepancies, a thorough and complete review should be conducted for similar modeling issues. (**Note:** This F&O is based on the original peer review).	
PRM-A4-05	PRM-A4	Finding		ESFAS signals are included in the Fire PRA. However, the documentation is not clear in how the either fire-induced spurious ESFAS (e.g., SI signals) are modeled for impact in the quantification for fire scenarios. Example: The cable selection calculation for XPP00043A:Off:Off includes an "Equipment Dependency" of "SIS(K608) {Off:Off, On:Off}"The draft calculation for cable selection DRAFTTR07800-009, Rev 0.D Section 4.3.6.7 states: "ESFAS SIGNALS" If the auxiliary contacts are associated with an ESFAS or other "system-wide" signal (e.g., safety injection signal, containment isolation signal, etc.), only those portions of the interfacing circuit uniquely associated with the component under investigation are included in the analysis for the component. The ESFAS signal is then listed as an "Equipment Dependency" as outlined above. The ESFAS signals are treated as "pseudo components" in the analysis. A pseudo component is intended to represent a collection of sub-components that make up a definable circuit, for example Train A SI. The rationale here is that higher-level signal failures will affect multiple components, not just the component of interest (e.g., a safety injection signal). Such failures should be addressed on a system-wide basis by the NSCA and Fire PRA models. This approach prevents adding the same cables to numerous components, which can mask the actual cause of multiple component losses." It is not clearly documented how the SI signal is modeled in the Fire PRA. Gate SIS-FIRE is a separate top gate that does not appear to be connected to other gates for components that could be impacted. Example interactions where the ESFAS signal could result in a component being failed in the undesired	The safety injection logic has been modified and is included in all areas of the tree as appropriate. Documentation is provided in Task 5.5 report.

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				functional state include: 1. Charging pump spurious start (potentially exacerbating VCT-RWST interaction or excessive charging challenging Pressurizer PORVs/safety valves) 2. Spurious opening of High Head injection valves (8801A/B) potentially resulting in excessive charging challenging Pressurizer PORVs/safety valves) 3. Spurious RHR pump start, when combined with suction or mini-flow valve closure, could damage the RHR pump. 4. Spurious RB spray actuation and RWST depletion (See F&O PRM-A4-05) Since the Spurious ESFAS interaction is not integrated into the rest of the CDF model, it is unclear how fire impacts resulting in inadvertent SI interaction are accounted for. Due to the unique treatment, the methodology and results of the assessment of spurious ESFAS signals should be documented in a manner to facilitate review. In addition, review of the existing logic structure (separate top gate SIS-FIRE) showed that only instruments are showing as input to the SIS-Fire Gate. The VCS RCS DBD indicates that some of the SI inputs are de-energize to actuate, so including simply cables associated with the instruments as input to SIS-FIRE may not accurately depict fire failures that could result in an inadvertent SI signal. It is unclear if the adverse impacts of fire-induced failure resulting in ESFAS signals are integrated in the Fire PRA. The methodology for treating this signal is not well described to facilitate PRA applications, upgrades, and peer review. Recommendation: Document the specific treatment of spurious ESFAS signals including: 1. Limitations on cable selection 2. How ESFAS signals ESFAS signals modeled in the Fire PRA (in the fault tree model and any unique treatments	

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				inconsistent with the rest of the fire modeling, e.g., separate top gate, separate reviews outside of the integrated CAFTA model, etc.) 3. Review the SIS-Fire gate inputs for accuracy to determine if there are power supply dependencies that are needed to accurately depict fire failures that could result in an inadvertent SI signal (e.g., power to instrument signals/cabinets whose fire-induced failure could result in the undesired consequence). 4. Determine how other fire-induced consequences that could cause a valid SI signal (e.g., normal spray valve stuck open resulting in rapid RCS pressure reduction) should be modeled in the Fire PRA. (**Note:** This F&O is based on the original peer review).	
PRM-B9-01	PRM-B9	Finding		The section of Task 5.5, Rev A. showing "Dependency modeling" does not match the fault tree referenced and provided to the review team. Discussions indicate that the model is still being modified though no list of changes made was available. The discrepancies indicate that the model is not stable, and raises questions regarding the results of the analysis. This appears to be a result of the model not being finished, or an issue associated with configuration control of the model/documentation relationship. Complete the model and update the documentation accordingly. (**Note:** This F&O is based on the original peer review).	See response to ES-B1-03.
PRM-B9-02	PRM-B9	Finding		Upon examination, selected components identified in ES (Task 5.2, table 3a) for inclusion into the PRA could not be validated as having been incorporated into the model. (example: FCV-0122). The linkage between ES and PRM is critical to assuring appropriate quantification results. Review the items in Table 3a, and provide a clear disposition	See response to ES-B1-03.

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				and link to the treatment of these items in PRM. (**Note:** This F&O is based on the original peer review).	
FSS-A4-01	FSS-A4	Finding		F&O: Main Methodology Report (DC0780B-001) Rev C is in draft in addition to other documents used in this review such as the Quantification Results Report, Task 5.14 and Uncertainty Report 5.15. Basis of Significance: A number of documents were not complete at the time of the review. Possible Resolution: Complete necessary reports and calculations that support development of fire scenarios and other supporting requirements. (**Note:** This DRAFT F&O is based on the follow-on peer review).	The fire modeling analysis in support of the Fire PRA "FSS" is documented in a series of reports: 1. A main methodology report describing the process, assumptions, etc 2. A report documenting the multi compartment analysis 3. A report documenting the analysis of fire scenarios affecting structural steel, and 4. An individual report for each fire zone identified in the plant partitioning task of the Fire PRA. These reports are finalized following the QA procedures established for the project, which includes review and approve activities.

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
FSS-A4-02	FSS-A4	Finding		F&O: Treatment of suppression credit for small fire scenarios is described in Main Fire Modeling report, section 6.1.3.2 Characterize Fire Ignition Sources. The guidance is not clear relative to credit given for the intermediate fire scenarios. For example, the suppression in the cable spread room is credited, but there is the special case of sprinkler heads in located in the tray which makes this assumption more reasonable. Basis for suppression credit is assumed during development of scenarios, but not documented in the zone fire modeling calculations. Basis of Significance: Standard requires basis for suppression credit during development of scenarios. The basis for the credit in mitigating hot gas layer scenarios is more generically acceptable as suppression systems are typically designed for this condition. They are not necessarily designed to significantly mitigate a small fire that may not be large enough or located correctly compared to the detection and/or sprinkler heads to be effective. Possible Resolution: Identify and justify credit taken in results calculations. (**Note:** This DRAFT F&O is based on the follow-on peer review).	Refer to resolution of FSS-A4-A1 for a listing of technical reports documenting the fire modeling analysis. Each individual zone report includes a section that lists the credited fire protection features in the fire scenarios postulated in the fire zone. To address this finding, this section is expanded to include justification for the credit and the assumptions governing this credit consistent with the requirements of the Fire PRA standard. The justification includes a brief system description, a qualitative or quantitative discussion on activation times, and the fire damage state in which the suppression system is credited.
FSS-B2-01	FSS-B2	Finding		F&O: Fire scenarios of MCR abandonment are not quantified. The calculation for the MCB fire scenarios in the MCR depicts the same CCDP for each fire scenario. It is expected that the CCDP for these fire scenarios should be different since different set of components are affected. Basis of Significance: Fire scenarios of MCR abandonment are not quantified. The calculation for the MCB fire scenarios in the MCR depicts the same CCDP fir each fire scenario. It is expected that the CCDP for these fire scenarios should be different since different set of components are affected. Possible Resolution: Quantify and document the identified	The Main Control Room Analysis is documented in two reports: 1) the individual fire zone report for the Main Control Room (see resolution to FSS-A4-01 for a listing of reports associated with the Fire Modeling analysis), and 2) the report describing the development of the logic model. The first report describes how abandonment of control room due to fire conditions in included in the

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				MCR abandonment scenarios. (**Note:** This DRAFT F&O is based on the follow-on peer review).	analysis. The second report describes how abandonment due to fire affecting plant operability is treated as well as the logic in the fault tree that quantifies the CCDP/CLERP for abandonment scenarios. Based on the technical discussions during the peer review activities, a number of quantification errors were found in the model. These errors consisted primarily in the incorrect mapping of cables to basic events due to a "space" character added in the one of the database fields. This error has been corrected and the correct mapping has been verified. Currently, the Fire PRA includes a number of fire scenarios, including abandonment characterizing the fire risk associated with these scenarios.
FSS-C7-01	FSS-C7	Finding		F&O: Section 6.1.3.3 of DC0780B_001 indicates that "It is assumed that dependencies between automatic and manual suppression systems will be eventually resolved by the fire brigade," but does not address how these dependencies will be resolved or what the FPRA impacts of these resolutions may be. Further documentation of these risk impacts and their treatment is needed. Basis of Significance: It is not apparent how the dependencies between automatic and manual suppression systems will be resolved by the fire brigade. From a FPRA standpoint, these dependencies have not been expressed in terms of frequencies or impacts. Possible Resolution: Expand the detection/ uppression event trees to capture these dependencies and impacts that are	Refer to resolution of FSS-A4-A1 for a listing of technical reports documenting the fire modeling analysis. Each individual zone report includes a section that lists the credited fire protection features in the fire scenarios postulated in the fire zone. To address this finding, this section is expanded to include justification for the credit and the assumptions governing this credit consistent with the requirements of the Fire PRA standard. The justification includes a brief system description, a qualitative or quantitative discussion on activation times, and the fire

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				currently left unresolved. (**Note:** This DRAFT F&O is based on the follow-on peer review).	damage state in which the suppression system is credited. In addition, this section includes a justification for the modeling of suppression in the analysis including a discussion on dependencies. The discussion on dependencies in based on an analysis of fire suppression systems credited (e.g., automatic sprinklers and fire brigade water) as a justification for the proper modeling in the Fire PRA.
FSS -D3-01	FSS -D3	Finding		F&O: Fire Modeling: Generic Methodology Calculation Number DC0780B-001. Also reviewed fire modeling for fire zones used for FSS-A1. Only 2 zones have been provided that utilized detailed fire modeling. See discussion in FSS-A1. The VCS methodology is to use successive refinements up to and including detailed fire modeling. The screening of zones and the method to treat subzones in non screened zones is clearly a bounding approach. The detailed fire modeling is used to further analyze the fire sub zones. This is accomplished by breaking apart the grouped ignition sources in the sub zone to into individual courses. This allows the frequency to be split and combined with individual CCDPs. However, this is still a conservative method as the large target population is still applied. The timing to impact the target sets is changed with the detailed fire modeling at VCS, but the overall damage set is maintained as that of the sub zone (and the zone for the HGL scenario, e g. CSR). 5-6 scenarios in the top 90% are in the one AB fire area. In spite of this, the review team concluded that the PRA team has demonstrated a process by which they are able to refine the analysis for the risk-significant fire zones to remove	This finding is due to primarily to the iterative nature of the Fire PRA. At the time of the peer review, a set of scenarios in a corridor in the AB building had received preliminary screening analysis. It was concluded that these scenarios should receive detailed analysis consistent with the detailed analysis conducted for other fire zones scenarios quantified to have lower risks at the time of review. To address this finding, the top risk contributors were reviewed and detailed analysis have been conducted to provide a bounding or realistic representation of the fire risk as required for the standard. This includes the scenarios identified in the AB building during the Peer Review week.

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				conservatism. Having a criterion to identify what significant risk is would be helpful. Basis of Significance: N/A Possible Resolution: N/A (**Note:** This DRAFT F&O is based on the follow-on peer review).	
FSS-D7-01	FSS-D7	Finding		F&O: Fire Modeling: Generic Methodology Calculation Number DC0780B-001, Section 6.1.3.3. Per discussion in the calculation, each credited system was reviewed to ensure the applicable codes and standards are met and that there is current surveillance testing to ensure operability is maintained. Plant specific data was not reviewed for this task; outlier experience was not searched for either. Basis of Significance: N/A Possible Resolution: Search for outlier experience. (**Note:** This DRAFT F&O is based on the follow-on peer review).	Refer to resolution of FSS-A4-A1 for a listing of technical reports documenting the fire modeling analysis. Each individual zone report includes a section that lists the credited fire protection features in the fire scenarios postulated in the fire zone. To address this finding, this section is expanded to include justification for the credit and the assumptions governing this credit consistent with the requirements of the Fire PRA standard. The justification includes a brief system description, a qualitative or quantitative discussion on activation times, and the fire damage state in which the suppression system is credited. In addition, this section includes a justification for the use of generic unreliability values for credited systems. The justification includes a review of system reliability and availability data (which is also referenced in the report) to ensure that the generic values are similar or higher than the plant specific values (i.e., justify that there is no outlier behavior in the plant).

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
FSS-D8-01	FSS-D8	Finding		F&O: Fire Modeling: Generic Methodology Calculation Number DC0780B-001, Section 6.1.33. The evidence from the document review and peer team walkdown is that suppression and detecting is credited. However, there is not explicit discussion of the results in the documentation. Therefore, this SR is not met. Basis of Significance: This is required to meet the SR. Possible Resolution: N/A (**Note:** This DRAFT F&O is based on the follow-on peer review).	See resolutions to findings FSS-A4-02, FSS-C7-01, FSS-D7-01. The resolution of these findings addresses this F&O FSS-D8-01.
FSS-D9-01	FSS-D9	Finding		F&O: Very limited issues of smoke damage are discussed. Basis of Significance: Required per the SR for meeting CC-II/III. Possible Resolution: Review and address the smoke damages for vulnerable equipment presented in Appendix T of NUREG/CR-6850. Generally, typical practice to disposition of smoke damage is assuming total damage of equipment located in target PAU. (**Note:** This DRAFT F&O is based on the follow-on peer review).	A qualitative discussion on smoke damage has been expanded in the main methodology fire modeling report and is consistent with the treatment of smoke damage in NUREG/CR-6850. The additional information provided discusses how the currently the FPRA bounds possible damages due to smoke in the short-term plant response.
FSS-G2-01	FSS-G2	Finding		The multi-compartment screening methodology includes, as its third and final step, screening based on fire modeling, with a fixed damage temperature of 200C based on the damage temperature for thermoplastic cables. This will not be conservative for exposed rooms containing targets with lower damage temperatures, such as solid-state equipment. The screening process should determine the screening damage temperature based on the lowest damage temperature for equipment contained in the exposed room rather than on a fixed temperature of 200 degrees C. Basis of Significance: Current screening method is discussed properly, but has been implemented as a fixed value of 200C.	The damage criteria for sensitive electronics have been incorporated in the analysis, not only for the multi compartment elements, but also for the single compartment analysis. This criterion is lower than the damage threshold for cables used in the analysis at the time of the peer review activities. The fire zones in which electrical panels with sensitive electronics are credited in the Fire PRA have been

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				Possible Resolution: Revise the implementation of this multi-compartment screening procedure so that the lowest damage temperature of equipment in the exposed room is used as the screening temperature. (**Note:** This DRAFT F&O is based on the follow-on peer review).	revisited to incorporate a lower damage threshold. This primarily includes the Relay Room (Fire Zone CB06) and the main control room (Fire Zone CB17.01).
FSS-F3-01	FSS-F3	Finding		F&O: The SR deals with structural failure of steel resulting from fire. A quantitative bounding analysis has been developed to estimate the CDF for the events identified in SR FSS-F1. The analysis is documented in the report DC0780B-001. The SR requires quantification to be done to meet the requirements of SRs under FQ, which requires evaluation of both CDF and LERF. Only CDF has been evaluated in the bounding analysis and the evaluation of LERF is missing. Also, it is not clear if the CDF and LERF results from this are included in the total FPRA results. They should be included in the final FPRA results. Basis of Significance: LERF needs to be evaluated to meet the SR at CC-II. Possible Resolution: Performa bounding evaluation for LERF for the scenario. Also, include the CDF and LERF results from this analysis while reporting the FPRA results. (**Note:** This DRAFT F&O is based on the follow-on peer review).	The report has been updated to include LERF calculations. This is an editorial comment as the fire scenarios associated to damage to structural steel elements are included in the quantification for both CDF and LERF values are quantified in the model. To address this F&O, the LERF results quantified are added to the report.
FSS-H5-01	FSS-H5	Finding		F&O: Output parameter uncertainty evaluations are not included as required to achieve Capability Category II. One approach that could be taken would be to include the output parameter uncertainties for CFAST included in the NUREG 1824 report. Basis of Significance: Output parameter uncertainly is required to achieve Capability Category II for this SR. Possible Resolution: Include output parameter uncertainties for CFAST included in the NUREG 1824 report.	A discussion on the parameter uncertainty associated with the fire modeling results (when applicable) has been included in the individual fire modeling zone reports. It should be noted that not all fire zones receive fire modeling analyses. Consequently, this discussion is added only in the reports in which analytical fire modeling has been conducted for

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				(**Note:** This DRAFT F&O is based on the follow-on peer review).	determining if hot gas layer scenarios are postulated in the fire zone. The parameter uncertainty discussion includes a qualitative listing of the uncertain parameters and when applicable the quantification of the uncertainty generated by key parameters as applicable to the scenario.
IGN-A5-01	IGN-A5	Finding		In a walkdown of Fire Compartment CB15 (Upper Cable Spreading Room) an electrical cabinet was identified that was not listed in Attachment IV. The cabinet is identified as XPN5427, and contains several Agastat relays. This is a missed ignition source which changes the fire ignition frequency for this fire compartment. Re-evaluate the fixed ignition source count for this Fire Compartment and correct the ignition frequency data. (**Note:** This F&O is based on the original peer review).	The fixed ignition source count for all compartments has been re-evaluated and the ignition frequency data has been updated. XPN5427 is now included in Attachment IV.
IGN-B5-01	IGN-B5	Finding		A discussion of the assumptions and sources of uncertainty are not identified in this report. The type of information needed to address this requirement is described in Appendix U of NUREG 6850. This SR provides a discussion and understanding of the uncertainty associated with the plant-specific analysis. This is a required element here and in UNC-A2. Include a qualitative discussion of the sources of uncertainty in the Fire Ignition Frequency Analysis report. Guidance is provided in Appendices U and V of NUREG 6850. (**Note:** This F&O is based on the original peer review).	The uncertainty bounds (5th and 95th percentiles) of the fire ignition frequencies are presented in Attachment II of the report. The method used to calculate the frequencies are presented in Section 4.9 of the report. The frequencies are calculated using the gamma distributions for the generic frequencies taken from Supplement 1 to NUREG/CR-6850.
CF-A1-01	CF-A1	Finding		Attachment 8 to DC00340-001, Circuit Failure Mode Likelihood Analysis, Task 5.10, documents the results of the circuit failure analyses and assigns failure probabilities to specific cable	Attachment 8 to DC00340-001, Circuit Failure Mode Likelihood Analysis, Task 5.10 has been revised using the recommended process in NUREG/CR-

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				failure modes. NUREG/CR-6850 Section 10.5.2 provides 2 recommended options for assigning CF probability values. Option 1 (use of tables) is recommended when circuits are of a type bounded by circuit testing, which includes grounded circuit. Option 2, The probability estimate formulas, are recommended for cases "where: * The circuit is ungrounded or is impedance grounded without ground fault trip capability." Contrary to the recommendations, the use of tables was used for all circuit types in Attachment 8 to DC00340-001, without a justification for the use of this process. In addition, cable failure likelihood values assigned in Attachment 8 to DC00340-001 do not always reflect Section 2.0 "Scope/Methodology" (which is based on NUREG/CR-6850, Vol. 2, Chapter 10) and the rationale for using different values is not documented in the calculation. Specifically, Section 1 of Attachment 8 to DC00340-001 and Section 10.5.2 of NUREG/CR-6850, include criteria for the appropriate use of the Tables 10-1 - 10-5 of NUREG/CR-6850: The circuit is of a grounded design. NUREG/CR-6850 Vol. 2 Section 10.5.2 states that: "The probability estimate formulas are recommended for cases where: ....* The circuit is ungrounded or is impedance grounded without ground fault trip capability, " Components addressed in Attachment 8 to DC00340-001 include ungrounded dc circuits, contrary to the statements in Section 2 of the calculations. No justification is provided for using the tabular values (as opposed to the Computational Probability Estimates of NUREG/CR-6850 for ungrounded circuits. In addition, It appears that a 0.30 was used as a default value for Psacd in Attachment 8 to DC00340-001 Rev. A as a highest screening value. This value is based on the presence of a CPT	6850 and using the clarification provided by FAQ 08-0047 in regards to quantification of spurious actuation probabilities. The analysis is performed in two stages using an initial screening method and subsequently a detailed analysis using Option # 1 of NUREG/CR-6850. An initial default screening value of 0.51 has been applied to all components susceptible to spurious operations and justification is provided. Components that are identified as risk significant are then selected for detailed analysis. The detailed analysis includes consideration of grounded circuits, CPT, Auxiliary circuits and multi-conductor or single-conductor cables. DC (ungrounded circuits) and complex circuits have been assigned conservative circuit failure probabilities. Option # 2 has been used to determine the circuit failure probability for 19 air operated valves with quick disconnect switches as described in calculation DC00340-002.

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				in Task 10 of NUREG/CR-6850 (which would apply to MOVs. Tables 10-2 and 10-4 of NUREG/CR-6850 Vol. 2 show a best estimate of 0.60 for M/C intra-cable thermoplastic cables without CPT. Use of the values that are inconsistent with industry guidance without justification will result in inconsistent results and future issues with program configuration control. Address circuit failure probabilities using the recommended process in NUREG/CR-6850 or provide a technical basis for use of plant-specific values. (**Note:** This F&O is based on the original peer review).	
CF-A1-02	CF-A1	Finding		Specific anomalies were identified in the assigned circuit failure mode likelihood values in Attachment 8 to DC00340-001, Revision A. A review of XVG08801B:CLOSED:CLOSED identified that four cables could cause the undesired spurious opening of the valve. One of the cables (SI C 74B) is a 2 conductor #12 awg cable. However, the analysis characterized it as a single conductor cable. Further review of the documentation found that all 2 conductor cables were treated in the analysis on the basis that it was susceptible to only inter-cable hot shorts and applied the 1/C value from the related NUREG-6850 table. This treatment does not address the potential for the 2 conductors to simply short together as an intra-cable hot short. As a consequence, it is unclear whether a higher conditional probability should have been used. In another example (HCV00186:OPEN:OPEN), it was determined that a 2 conductor #16 awg was identified as the circuit of concern. In this case, the circuit is either an instrument or voltage control loop. The drawings for this circuit were not readily available for review. However, the nature of an instrument control loop is such that its behavior varies depending on how the end device is calibrated. In this particular case, the subject valve positioner could be setup to	As described in disposition to CF-A1-01, Attachment 8 to DC00340-001, Circuit Failure Mode Likelihood Analysis, Task 5.10 has been revised using the recommended process in NUREG/CR-6850 and using the clarification provided by FAQ 08-0047 in regards to quantification of spurious actuation probabilities. Specific anomalies described in the finding have been addressed.

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				fully open or close on loss of the control signal. As such, it is unknown without further review, whether the undesired spurious closure could occur due to a simple functional failure of the circuit. Further review of the details determined that this valve would fail open on loss of air or motive power. Given this design, it would appear reasonable that fire induced failure of the circuitry would result in the valve opening and that multiple inter-cable hot shorts would be necessary to cause the valve to spuriously close. In this instance, it appears that the applied value is conservative. However, there does not appear to be any discussion of a methodology or approach that was used to develop the assigned values that adequately address instrument control circuits of this type. In addition, it was noted that the chosen value of 0.20 was used for all applicable fire scenarios except XPN07001. For XPN07001, a value of 0.44 was listed as the applicable value in the report which appears to be a typographical error. In all cases, the scenario involved the same single cable and the value actually used in the analysis is 0.20. Use of the values that are inconsistent with industry guidance without justification will result in inconsistent results and future issues with program configuration control. Address circuit failure probabilities using the recommended process in NUREG/CR-6850 or provide a technical basis for use of plant-specific values. (**Note:** This F&O is based on the original peer review).	
HRA-B4-01	HRA-B4	Finding		The Evaluation of EOPs for Undesired Operator Actions per Table 6c of DC00340-001 depicts Instrumentation TI-499A and TI-499B as not screened since the EOP's say to check TI-499A and TI-499B only, for RCS Sub cooling. Instrumentation TI-499C/D are specifically excluded per the documentation, however, these two instruments are included under the "AND" gate G320. This issue relates to an issue of the documentation not	The model has been corrected. See gate G320.

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				matching the model and an error in the modeling. Correct the Fault Tree logic and ensure that documentation matches the logic. (**Note:** This F&O is based on the original peer review).	
HRA-B4-02	HRA-B4	Finding		Logic under gate G317 includes three different types of instrument failures; temperature transmitters, level transmitters, and pressure transmitters. The level and temperature transmitters are discussed in the documentation Attachment 2 to DC00340-001 task 5.2, Table 6.2C, however, the pressure transmitters are not discussed. This is a gap between the documentation and the fault tree database. In addition, neither the pressure transmitter nor the level transmitter is listed in Table 6d-3. Ensure that the model and the documentation match. (**Note:** This F&O is based on the original peer review).	The pressure transmitters are included in Tables 6a and 6d-1 of Task 5.2 report. Check the fault tree database.
HRA-C1-01	HRA-C1	Finding		The timing evaluation for Operator Action, BAPM-XPP39AHE-F (Operator Fails to start SW pump P-39A) is based upon an operator action to swap charging pumps in order to gain additional time for this HRA. In essence, an HRA within an HRA exists with no accounting for the failure dependencies associated with swapping the charging pumps. The dependencies associated with the operator action to swap charging pumps is relatively large and is not accounted for this analysis. Remove the dependency for the charging pump swap in the recovery action. (**Note:** This F&O is based on the original peer review).	Revised HEP calculation to remove the dependency charging pump swap in the recovery action.
HRA-C1-02	HRA-C1	Finding		The basis for the required time required to perform a manual action during a fire adds an additional 5 minutes for inside control room actions and 10 minutes for outside control room actions. The basis for these estimates is not found and should	Basis to be documented in the task 5.12 report.

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				be validated or referenced to an approved methodology. While these estimates appear to be reasonable, a basis is not provided. A basis for the timings should be validated/bounded by JPMs, walkdowns, Ops Interviews, etc. or referenced to an approved methodology. (**Note:** This F&O is based on the original peer review).	
HRA-D2-01	HRA-D2	Finding		The accounting for dependencies has not been completed and rules developed in a manner that ensure that all HRA dependencies associated with the Fire PRA model results are identified and corrected. A partial review of the results for dependencies has been performed. However, a complete review to ensure all dependencies are captured could have significant impact on results. A review of the resulting cutset files is required to ensure that all dependencies are identified. (**Note:** This F&O is based on the original peer review).	An evaluation to document the dependency analysis for the VCSNS fire human reliability analysis is provided in the report LK19897, Dependent Event Analysis for the Fire HRA, dated 08/09/2010. Multiplier values to account for HRA dependence were calculated. These were used in the rfinal6b_fire.txt file which is used by QRECOVER to apply dependent multipliers at a cutset level to the fire PRA results.
SF-A4-01	SF-A4	Finding		Plant procedures EPP-107 "Conduct of Fire Brigade Drills" and EPP-015 "Natural Emergencies" were assessed by VC Summer as part of Attachment 11 to DC00340-001. VC Summer concluded that seismically induced fire currently is not explicitly expressed or captured in the VCS plant procedures or in the scenarios postulated in the Fire PRA. It does not appear that training of fire protection personnel or firefighting equipment impact in response to a seismically induced fire is addressed in the procedures. This F&O can be closed by disposition the open ended statement in the last paragraph of Section 6.3 and Section 7.0 of Attachment 11 to DC00340-001; procedural guidance on fire brigade responses, training and spurious operation of fire suppression systems.	The referred sentences in the F/O have been revised to address the comment. Specifically, the text now offers recommendation on addressing specific seismic issues in the procedures so that training to the applicable procedures can be established.

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				(**Note:** This F&O is based on the original peer review).	
FQ-E1-01	FQ-E1	Finding		F&O: Importance of basic events/components is not reviewed to determine that they make logical sense. Basis for Significance: N/A Possible Resolution: Perform importance analysis after developing one-top plant response model. (**Note:** This DRAFT F&O is based on the follow-on peer review).	Software limitations prevent creating a one top model and performing importance calculations. A consistency review of the CDF and LERF results has been performed to ensure the results of all fire scenarios are consistent with expectations and operational experience. A sampling of non-significant accident cutsets or sequences has been performed for reasonableness.
UNC-A2-01	UNC-A2	Finding		F&O: The SR requires the FPRA to address and document the areas of uncertainty in SRs PRM-A4, FQ-F1, IGN-A10, IGN-B5, FSS-E3, FSS-E4, FSS-H5, FSS-H9, and CF-A2. VCS FPRA has carried out sensitivity studies in lieu of Uncertainty analysis. However, there is no clear documentation of where or how the above areas of uncertainty are addressed. Basis for Significance: Needed to meet the SR Possible Resolution: Include a table in the report that shows the areas of uncertainty in SRs PRM-A4, FQ-F1, IGN-A10, IGN-B5, FSS-E3, FSS-E4, FSS-H5, FSS-H9, and CF-A2 and document how they are addressed in the sensitivity analysis. (**Note:** This DRAFT F&O is based on the follow-on peer review).	The uncertainty analysis report has been revised to address the listed areas of uncertainty.
UNC-A2-02	UNC-A2	Finding		F&O: Uncertainty analysis is documented in ENGINEERING SERVICES DESIGN CALCULATIONS, ATTACHMENT 13 TO DC00340-001 FIRE PRA, SENSITIVITY AND UNCERTAINTY REPORT, TASK 5.15, REVISION A - DRAFT. VCS FPRA has carried out sensitivity analysis in lieu of uncertainty analysis. The analysis is still in a draft form and has not been signed off. Basis for Significance: Analysis is not finalized. Possible Resolution: Finalize the analysis.	The uncertainty analysis report has been revised to address the listed areas of uncertainty.

Table V-18 Facts and Observations Detail

F&O #	SR	Level	Other Affected SRs	Finding	Disposition
				(**Note:** This DRAFT F&O is based on the follow-on peer review).	
UNC-A2-03	UNC-A2	Finding		F&O: VCS FPRA includes sensitivity analysis in lieu of uncertainty analysis. The report has the following footnote while reporting the results of the sensitivity analysis of HRA: "Results using the original IE HEPs did not quantify as expected. This sensitivity is being reviewed and will be updated". This casts doubt on the accuracy of the FPRA model. Basis for Significance: The resolution of the issue could impact the FPRA results. Possible Resolution: Review the model and make the corrections needed so the results of HRA sensitivity study are consistent with analyst's expectation. (**Note:** This DRAFT F&O is based on the follow-on peer review).	The sensitivity related to HEPs has been reviewed and updated. The results are now as expected. The report has been modified.

Note: Table V-18 is based on the original as well as follow-on peer review which included 57 SRs. A few SRs associated with the technical element FSS were in the scope of both the original and follow-on peer review. The information in this Table reflects only those from the follow-on peer review.

W. Fire PRA Insights

13 Pages Attached

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X. Other Requests for Approval

3 Pages Attached

Approval Request X1

NFPA 805 Section: 4.2.3.3 (b)

Request: Approval is requested for locations in the plant where twenty feet of separation is required, but intervening combustibles exist. The intervening combustibles are in the form of exposed cable trays.

Basis for Request: The following items serve as the basis for acceptability for this request:

- Cables in subject trays are IEEE-383 qualified or better. These thermoset cables have a low heat release rate and flame spread rating. Per NUREG/CR-6850, thermoset cables in cable trays have a flame spread rating equal to 3.54 ft/hr. As such, the expected time for a fire to propagate across the 20-foot separation zone from one cable tray to the redundant cable tray is 5.6 hours. NFPA 805, Section 4.2.3 only requires a maximum fire resistance for separation of redundant trains to be 3 hours. If a fire occurs on one side of the separation zone, then the length of time for a fire to propagate across the separation zone by means of the intervening combustibles (cables in cable tray) exceeds the 3 hour fire resistance requirement. Therefore, a level of protection commensurate with the intent of NFPA 805, Section 4.2.3 is achieved.
- If a fire were to occur in the center of the separation zone, the expected time for a fire to propagate to both sides of the zone and damage both redundant trains is 2.8 hours. The presence of a fire in a separation zone is mitigated by the presence of automatic fire detection and automatic fire suppression in areas of the plant and fire brigade response. Therefore, it is not credible that a fire affecting one success path could propagate by means of the intervening cable trays within the 20-foot separation area to the redundant success paths.
- A potential fire hazard is further limited as IEEE-383 qualified, thermoset cables have been shown to not be capable of self-ignition. This characteristic combined with the lack of other combustible materials or fire hazards within the 20-foot separation zone ensures a low probability of fire originating in the separation area.
- The presence of cable trays (filled primarily with IEEE 383 or better cable) across a fire zone, is not considered to have a significant impact as an intervening combustible for purposes of evaluating intervening combustible material. This conclusion is conditional upon the redundant components or circuits having at least 20 feet of separation. VCSNS evaluates areas with 20 feet of separation of redundant equipment/circuits as necessary to ensure that adequate fire protection measures are in place (automatic fire detection, automatic fire suppression, manual suppression equipment, etc.) to mitigate the hazard of intervening combustibles.

Acceptance Criteria Evaluation:

Nuclear Safety and Radiological Release Performance Criteria:

Based on the analysis above, the presence of intervening combustibles in the form of cable trays has no adverse effect on the nuclear safety performance criteria as applicable and identified by VCSNS and NFPA 805 Section 1.5.

The radiological release performance criteria are not affected by the presence of intervening combustibles in the form of cable trays.

Safety Margin and Defense-in-Depth:

Based on the analysis above, the presence of intervening combustibles in the form of cable trays will not have an adverse impact on the Nuclear Safety Performance Criteria, and therefore, the safety margin inherent in the analysis has been preserved.

The presence of intervening combustibles in the form of cable trays do not compromise the automatic and manual fire detection and suppression systems or the Nuclear Safety Performance Criteria, and therefore, defense-in-depth is maintained.

Conclusion:

VCSNS determined that the presence of intervening combustibles in the form of cable trays maintains the following criteria:

- Satisfies the performance goals performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release;
- Maintains safety margins; and
- Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).

RC-11-0149

Enclosure 2

South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
Docket 50-395

Transition to 10 CFR 50.48(c) - NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition

SCE&G® A SCANA COMPANY

List of Regulatory Commitments

November 15, 2011

VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)

ENCLOSURE 2

LIST OF REGULATORY COMMITMENTS

FIRE PROTECTION PROGRAM TRANSITION TO NFPA 805

The following table identifies those actions committed to by SCE&G, Virgil C. Summer Nuclear Station in this document. Any other statements in this submittal are provided for information purposes and are not considered to be commitments. Please direct questions regarding these commitments to Bruce L. Thompson, Manager, Nuclear Licensing, (803) 931-5042.

Commitment	Due Date/Event
ECR50577: NFPA 805 Instrument Air Recovery Provide auto start capability for the Diesel Driven Air Compressor (XAC0014).	2012
ECR50780: Alternate Seal Injection (MSPI) Provide addition high pressure pump/ Diesel Generator to mitigate loss of RCP seal cooling (NFPA 805 Credit).	2013
ECR50784: NFPA 805 Circuit/ Tubing Protection Provide protection of tubing/ circuits from the effects of fire.	2015
ECR50799: NFPA 805 RCP Seal Replacement Provide lower leakage RCP Seals [Outage].	2015
ECR50800: NFPA 805 1DA 115kV Supply Reroute Reroute 115kV Feed to ESF bus 1DA (Risk) [Outage].	2015
ECR50810: NFPA 805 Hazard Protection Provide mitigation strategies to address fire initiators or limit fire propagation.	2015
ECR50811: NFPA 805 Incipient Detection Provide Incipient Detection System at the top of selected electrical panels in the Relay and Upper Cable Spreading Rooms.	2013
ECR50812: NFPA 805 Disconnect Switch Rework Protect or reroute the disconnect switch cables.	2015
ECR70588: NFPA 805 Penetration Seal Documentation Document updates to include improved penetration details and alignment with vendor tests.	2014

Commitment	Due Date/Event
ECR71553: NFPA 805 Communication Provide alternate backup, protected communication system to support fire event.	2013
Implementation Items listed in Enclosure 2, Attachment S, Table S-2.	180 days after NRC approval of the LAR

RC-11-0149

Enclosure 3

South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
Docket 50-395

Transition to 10 CFR 50.48(c) - NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition

SCE&G®
A SCANA COMPANY

Operating License & Technical Specification Changes

November 15, 2011

VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)

ENCLOSURE 3

Operating License & Technical Specification Changes

Attachment to License Amendment No. LAR-06-00055
To Facility Operating License No. NPF-12
Docket No. 50-395

Replace the following pages of the Operating License and Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove Pages	Insert Pages
OL Pages 7 & 8	OL Pages 7, 7a, 7b & 8
TS Page 6-11	TS Page 6-11

Proposed Operating License Condition Changes (Markup)

4 Pages

b. In the event that one-third thickness semi-circular reference flaws cannot be detected and discriminated from inherent anomalies, the entire volume of the weld shall be examined during the inservice inspection.

c. The reporting of the inservice inspection examination results shall be documented in a manner to define qualitatively whether, the weldment and the heat affected zone and adjacent base metal on both sides of the weld were examined by ultrasonic angle beam techniques.

(12) Design Description - Control (Section 4.3.2, SER)

SCE&G is prohibited from using part-length rods during power operation.

(13) Deleted

(14) Deleted

(15) Deleted

(16) Cable Tray Separation (Section 8.3.3, SSER 4)

Prior to startup after the first refueling outage, SCE&G shall implement the modifications to the cable trays discussed in Section 8.3.3 of Supplement No. 4 to the Safety Evaluation Report or demonstrate to the NRC staff that faults induced in non-class 1E cable trays will not result in failure of cable in the adjacent Class 1E cable trays.

(17) Alternate Shutdown System (Section 9.5.1, SSER 4)

Prior to startup after the first refueling outage, SCE&G shall install a source range neutron flux monitor independent of the control complex as part of the alternate shutdown system.

Delete and Replace With Attachment I

(18) ~~Fire Protection System (Section 9.5.1, SSER 4)~~

~~Virgil C. Summer Nuclear Station shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report for the facility, and as approved in the Safety Evaluation Report (SER) dated February 1981 (and Supplements dated January 1982 and August 1982) and Safety Evaluations dated May 22, 1986, November 26, 1986, and July 27, 1987 subject to the following provisions:~~

~~The licensee may make changes to the approved fire protection program without prior approval of the~~

Delete

~~Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of fire.~~

(19) Instrument and Control Vibration Tests for Emergency Diesel Engine Auxiliary Support Systems (Section 9.5.4, SER)

Prior to startup after the first refueling outage, SCE&G shall either provide test results and results of analyses to the NRC staff for review and approval which validate that the skid-mounted control panels and mounted equipment have been developed, tested, and qualified for operation under severe vibrational stresses encountered during diesel engine operation, or SCE&G shall floor mount the control panels presently furnished with the diesel generators separate from the skid on a vibration-free floor area.

(20) Solid Radioactive Waste Treatment System (Section 11.2.3, SSER 4)

SCE&G shall not ship "wet" solid wastes from the facility until the NRC staff has reviewed and approved the process control program for the cement solidification system.

(21) Process and Effluent Radiological Monitoring and Sampling Systems (Section 11.3, SSER 4)

Prior to startup after the first refueling outage, SCE&G shall install and calibrate the condensate demineralizer backwash effluent monitor RM-L11.

(22) Core Reactivity Insertion Events (Section 15.2.4, SSER 4)

For operations above 90% of full power, SCE&G shall control the reactor manually or the rods shall be out greater than 215 steps until written approval is received from the NRC staff authorizing removal of this restriction.

(23) NUREG-0737 Conditions (Section 22)

SCE&G shall complete the following conditions to the satisfaction of the NRC staff. Each item references the related subpart of Section 22 of the SER and/or its supplements.

a. Procedures for Transients and Accidents (I.C.1, SSER 4)

Prior to startup after the first refueling outage, SCE&G shall implement emergency operating procedures based on guidelines approved by the NRC staff.

Operating License Condition – Attachment 1

Fire Protection System

South Carolina & Electric Gas Company shall implement and maintain in effect all provisions of the approved fire protection program that comply with 10 CFR 50.48(a) and 10 CFR 50.48(c), as specified in the licensee amendment request dated November 15, 2011 and as approved in the safety evaluation report dated ___________. Except where NRC approval for changes or deviations is required by 10 CFR 50.48(c), and provided no other regulation, technical specification, license condition or requirement would require prior NRC approval, the licensee may make changes to the fire protection program without prior approval of the Commission if those changes satisfy the provisions set forth in 10 CFR 50.48(a) and 10 CFR 50.48(c), the change does not require a change to a technical specification or a license condition, and the criteria listed below are satisfied.

Risk-Informed Changes that May Be Made Without Prior NRC Approval

A risk assessment of the change must demonstrate that the acceptance criteria below are met. The risk assessment approach, methods, and data shall be acceptable to the NRC and shall be appropriate for the nature and scope of the change being evaluated; be based on the as-built, as-operated, and maintained plant; and reflect the operating experience at the plant. Acceptable methods to assess the risk of the change may include methods that have been used in the peer-reviewed fire PRA model, methods that have been approved by NRC through a plant-specific license amendment or NRC approval of generic methods specifically for use in NFPA 805 risk assessments, or methods that have been demonstrated to bound the risk impact.

(a) Prior NRC review and approval is not required for changes that clearly result in a decrease in risk. The proposed change must also be consistent with the defense-in-depth philosophy and must maintain sufficient safety margins. The change may be implemented following completion of the plant change evaluation.

(b) Prior NRC review and approval is not required for individual changes that result in a risk increase less than 1×10^{-7}/year (yr) for CDF and less than 1×10^{-8}/yr for LERF. The proposed change must also be consistent with the defense-in-depth philosophy and must maintain sufficient safety margins. The change may be implemented following completion of the plant change evaluation.

Other Changes that May Be Made Without Prior NRC Approval

(1) Changes to NFPA 805, Chapter 3, Fundamental Fire Protection Program

Prior NRC review and approval are not required for changes to the NFPA 805, Chapter 3, fundamental fire protection program elements and design requirements for which an engineering evaluation demonstrates that the alternative to the Chapter 3 element is functionally equivalent or adequate for the hazard. The licensee may use an engineering evaluation to demonstrate that a change to an NFPA 805, Chapter 3, element is functionally equivalent to the corresponding technical requirement. A qualified fire protection engineer shall perform the engineering evaluation and conclude that the change has not affected the functionality of the component, system, procedure, or physical arrangement, using a relevant technical requirement or standard.

Operating License Condition – Attachment 1

The licensee may use an engineering evaluation to demonstrate that changes to certain NFPA 805, Chapter 3, elements are acceptable because the alternative is "adequate for the hazard." Prior NRC review and approval would not be required for alternatives to four specific sections of NFPA 805, Chapter 3, for which an engineering evaluation demonstrates that the alternative to the Chapter 3 element is adequate for the hazard. A qualified fire protection engineer shall perform the engineering evaluation and conclude that the change has not affected the functionality of the component, system, procedure, or physical arrangement, using a relevant technical requirement or standard. The four specific sections of NFPA 805, Chapter 3, are as follows:

- Fire Alarm and Detection Systems (Section 3.8);
- Automatic and Manual Water-Based Fire Suppression Systems (Section 3.9);
- Gaseous Fire Suppression Systems (Section 3.10); and,
- Passive Fire Protection Features (Section 3.11).

(2) Fire Protection Program Changes that Have No More than Minimal Risk Impact

Prior NRC review and approval are not required for changes to the licensee's fire protection program that have been demonstrated to have no more than a minimal risk impact. The licensee may use its screening process as approved in the NRC safety evaluation report dated ________ to determine that certain fire protection program changes meet the minimal criterion. The licensee shall ensure that fire protection defense-in-depth and safety margins are maintained when changes are made to the fire protection program.

Transition License Conditions

(1) Before achieving full compliance with 10 CFR 50.48(c), as specified by (2) below, risk-informed changes to the licensee's fire protection program may not be made without prior NRC review and approval unless the change has been demonstrated to have no more than a minimal risk impact, as described in (2) above.

(2) The licensee shall implement the following modifications to its facility to complete the transition to full compliance with 10 CFR 50.48(c) by December 31, 2015:

- ECR50577: NFPA 805 Instrument Air Recovery
- ECR50780: Alternate Seal Injection (MSPI)
- ECR50784: NFPA 805 Circuit/ Tubing Protection
- ECR50799: NFPA 805 RCP Seal Replacement
- ECR50800: NFPA 805 1DA 115kV Supply Reroute
- ECR50810: NFPA 805 Hazard Protection
- ECR50811: NFPA 805 Incipient Detection
- ECR50812: NFPA 805 Disconnect Switch Rework
- ECR70588: NFPA 805 Penetration Seal Documentation
- ECR71553: NFPA 805 Communication

(3) The licensee shall maintain appropriate compensatory measures in place until completion of the modifications delineated above.

Proposed Operating License Condition Changes (Retype)

4 Pages

b. In the event that one-third thickness semi-circular reference flaws cannot be detected and discriminated from inherent anomalies, the entire volume of the weld shall be examined during the inservice inspection.

c. The reporting of the inservice inspection examination results shall be documented in a manner to define qualitatively whether, the weldment and the heat affected zone and adjacent base metal on both sides of the weld were examined by ultrasonic angle beam techniques.

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Prior to startup after the first refueling outage, SCE&G shall install a source range neutron flux monitor independent of the control complex as part of the altemate shutdown system.

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South Carolina Electric & Gas Company shall implement and maintain in effect all provisions of the approved fire protection program that comply with 10 CFR 50.48(a) and 10 CFR 50.48(c), as specified in the licensee amendment request dated November 15, 2011 and as approved in the safety evaluation report dated ___________. Except where NRC approval for changes or deviations is required by 10 CFR 50.48(c), and provided no other regulation, technical specification, license condition or requirement would require prior NRC approval, the licensee may make changes to the fire protection program without prior approval of the Commission if those changes satisfy the provisions set forth in 10 CFR 50.48(a) and 10 CFR 50.48(c), the change does not require a change to a technical specification or a license condition, and the criteria listed below are satisfied.

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A risk assessment of the change must demonstrate that the acceptance criteria below are met. The risk assessment approach, methods, and data shall be acceptable to the NRC and shall be appropriate for the nature and scope of the change being evaluated; be based on the as-built, as-operated, and maintained plant; and reflect the operating experience at the plant. Acceptable methods to assess the risk of the change may include methods that have been used in the peer-reviewed fire PRA model, methods that have been approved by NRC through a plant-specific license amendment or NRC approval of generic methods specifically for use in NFPA 805 risk assessments, or methods that have been demonstrated to bound the risk impact.

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- ECR70588: NFPA 805 Penetration Seal Documentation
- ECR71553: NFPA 805 Communication

(3) The licensee shall maintain appropriate compensatory measures in place until completion of the modifications delineated above.

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Prior to startup after the first refueling outage, SCE&G shall either provide test results and results of analyses to the NRC staff for review and approval which validate that the skid-mounted control panels and mounted equipment have been developed, tested, and qualified for operation under severe vibrational stresses encountered during diesel engine operation, or SCE&G shall floor mount the control panels presently furnished with the diesel generators separate from the skid on a vibration-free floor area.

(20) Solid Radioactive Waste Treatment System (Section 11.2.3, SSER 4)

SCE&G shall not ship "wet" solid wastes from the facility until the NRC staff has reviewed and approved the process control program for the cement solidification system.

(21) Process and Effluent Radiological Monitoring and Sampling Systems (Section 11.3, SSER 4]

Prior to startup after the first refueling outage, SCE&G shall install and calibrate the condensate demineralizer backwash effluent monitor RM-L11.

(22) Core Reactivity Insertion Events (Section 15.2.4, SSER 4)

For operations above 90% of full power, SCE&G shall control the reactor manually or the rods shall be out greater than 215 steps until written approval is received from the NRC staff authorizing removal of this restriction.

(23) NUREG-0737 Conditions (Section 22)

SCE&G shall complete the following conditions to the satisfaction of the NRC staff. Each item references the related subpart of Section 22 of the SER and/or its supplements.

a. Procedures for Transients and Accidents (I.C.1 SSER 4)

Prior to startup after the first refueling outage, SCE&G shall implement emergency operating procedures based on guidelines approved by the NRC staff.

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d. Critical operation of the unit shall not be resumed until authorized by the Commission.

6.8 PROCEDURES AND PROGRAMS

6.8.1 Written procedures shall be established, implemented and maintained covering the activities referenced below:

a. The applicable procedures recommended in Appendix "A" of Regulatory Guide 1.33, Revision 2, February 1978.
b. Refueling operations.
c. Surveillance and test activities of safety-related equipment.
d. Security Plan.
e. Emergency Plan.
Delete
f. Fire Protection Program.
f. g. PROCESS CONTROL PROGRAM.
g. h. OFFSITE DOSE CALCULATION MANUAL.
h. i. Effluent and environmental monitoring program using the guidance in Regulatory Guide 4.15, Revision 1, February 1979.

6.8.2 Each procedure of 6.8.1 above, and changes thereto, shall be reviewed prior to implementation as set forth in 6.5 above.

6.8.3 NOT USED.

6.8.4 The following programs shall be established, implemented and maintained:

a. Primary Coolant Sources Outside Containment

A program to reduce leakage from those portions of systems outside containment that could contain highly radioactive fluids during a serious transient or accident to as low as practical levels. The systems include the chemical and volume control, letdown, safety injection, residual heat removal, nuclear sampling, liquid radwaste handling, gas radwaste handling and reactor building spray system. The program shall include the following:

1) Preventive maintenance and periodic visual inspection requirements, and
2) Integrated leak test requirements for each system at refueling cycle intervals or less.

b. In-Plant Radiation Monitoring

1) Training of personnel,
2) Procedures for monitoring, and
3) Provisions for maintenance of sampling and analysis equipment.

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d. Critical operation of the unit shall not be resumed until authorized by the Commission.

6.8 PROCEDURES AND PROGRAMS

6.8.1 Written procedures shall be established, implemented and maintained covering the activities referenced below:

a. The applicable procedures recommended in Appendix "A" of Regulatory Guide 1.33, Revision 2, February 1978.
b. Refueling operations.
c. Surveillance and test activities of safety-related equipment.
d. Security Plan.
e. Emergency Plan.
f. PROCESS CONTROL PROGRAM.
g. OFFSITE DOSE CALCULATION MANUAL.
h. Effluent and environmental monitoring program using the guidance in Regulatory Guide 4.15, Revision 1, February 1979.

6.8.2 Each procedure of 6.8.1 above, and changes thereto, shall be reviewed prior to implementation as set forth in 6.5 above.

6.8.3 NOT USED.

6.8.4 The following programs shall be established, implemented and maintained:

a. Primary Coolant Sources Outside Containment

A program to reduce leakage from those portions of systems outside containment that could contain highly radioactive fluids during a serious transient or accident to as low as practical levels. The systems include the chemical and volume control, letdown, safety injection, residual heat removal, nuclear sampling, liquid radwaste handling, gas radwaste handling and reactor building spray system. The program shall include the following:

1) Preventive maintenance and periodic visual inspection requirements, and
2) Integrated leak test requirements for each system at refueling cycle intervals or less.

b. In-Plant Radiation Monitoring

1) Training of personnel,
2) Procedures for monitoring, and
3) Provisions for maintenance of sampling and analysis equipment.