ENCLOSURE 1

NINE MILE POINT UNIT 1

RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION

REGARDING THE PROPOSED ADOPTION OF NFPA 805

(2001 EDITION)

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RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION REGARDING THE PROPOSED ADOPTION OF NFPA 805 (2001 EDITION)

By letter dated June 11, 2012, Nine Mile Point Nuclear Station, LLC (NMPNS) requested an amendment to the Nine Mile Point Unit 1 (NMP1) Renewed Facility Operating License DPR-63. The proposed amendment would adopt a new risk-informed performance-based (RI-PB) fire protection licensing basis which complies with the requirements in 10 CFR 50.48(a) and 10 CFR 50.48(c); the guidance in Regulatory Guide (RG) 1.205, "Risk-Informed Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," Revision 1; and National Fire Protection Association (NFPA) 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition.

This enclosure provides supplemental information in response to the following three requests for additional information (RAIs) documented in the NRC's letter dated January 3, 2013: Safe Shutdown / Circuit Analysis RAI 01, RAI 03, and RAI 07. NMPNS agreed to provide responses to these three RAIs by April 30, 2013. Each individual NRC RAI is repeated (in italics), followed by the NMPNS response.

Safe Shutdown / Circuit Analysis RAI 01

The description in LAR Section 4.2.1.2 of safe and stable is defined as, "the ability to maintain $K_{eff} < 0.99$ with a reactor coolant temperature at or below the requirement for hot shutdown and then subsequently cool down and maintain NMP1 in a cold shutdown condition." The nuclear safety capability assessment (NSCA) methodology review (LAR Attachment B) includes discussion of cold shutdown (CSD) methodology as appropriate and the methods for meeting performance goals in the fire area assessments (LAR Attachment C) include CSD components and systems.

Additional information is needed regarding the timing, systems, actions, and any repairs, necessary to achieve and maintain CSD. There is no discussion of the risk associated with actions to achieve and maintain CSD.

VFDRs are identified in LAR Attachment C for performance criteria related to CSD. In some cases, these VFDRs are dispositioned on the basis that the risk, defense-in-depth (DID), and safety margins meet the acceptance criteria of NFPA 805 with a recovery action (RA) credited. The VFDR disposition further states the RA has been evaluated for feasibility and reliability within the FPRA using HRA methods (e.g., Attachment C, pg. 64, VFDR-05-025).

Additional information is needed to address the following specific issues:

a. *Provide the timing assumed for sustaining hot shutdown (once achieved) and then transitioning from hot shutdown to, and achieving CSD.*

b. *Describe how cold shutdown was modeled in the FPRA, including the risk of RAs credited for disposition of VFDRs associated with CSD NSCA equipment.*

c. *System or component capacity limitations are not specifically described for each applicable performance goal. Provide a description of capacity limitations, need to replenish systems, and time-critical actions for other systems needed to maintain safe and stable conditions (e.g., nitrogen supply for valve operations, water supplies, boron supply, DC battery power, fuel, etc.).*

d. *Describe in more detail the resource (staffing) requirements, timing, and feasibility of operator actions to recover NSCA equipment to achieve and sustain safe and stable conditions.*

e. *Attachment G describes actions involving repairs to valve and pump wiring for shutdown cooling. Describe in more detail the resource (staffing) requirements, timing, and feasibility of actions to repair NSCA equipment to achieve and maintain CSD safe and stable conditions.*

f. *Provide a more detailed description of the risk of failure of operator actions and equipment necessary to sustain safe and stable conditions.*

g. *Describe the actions that are planned for MSOs for shutdown cooling or any time the need to restore decay heat removal is short based on time to boil.*

Response to Safe Shutdown / Circuit Analysis RAI 01

General

Nine Mile Point Nuclear Station, LLC (NMPNS) has elected to modify its NFPA 805 transition analysis for NMP1 to revise the approach for demonstrating the ability to reach and maintain safe and stable conditions, as specified by NFPA 805. The original Nuclear Safety Capability Assessment (NSCA) established as its basis for demonstrating safe and stable conditions the requirement to maintain K_{eff} < 0.99 with a reactor coolant temperature at or below the requirements for hot shutdown and then subsequently cool down and maintain the plant in a cold shutdown condition. Consistent with NFPA 805 and supplemental guidance, NMPNS is revising its basis for the NMP1 NSCA to include only the requirement to establish hot shutdown conditions, including long-term hot shutdown capability. The response to this RAI, including Parts a through g, is provided within the context of the aforementioned change.

Demonstration of the nuclear safety performance criteria for safe and stable conditions is performed in two analyses based on the plant operating modes, as defined in the NMP1 Technical Specifications (TS). These analyses are defined as follows:

- At-Power analysis for potential fires while in either: (i) the Power Operating Condition (Reactor mode switch is in "Startup" or "Run" position and the reactor is critical or criticality is possible due to control rod withdrawal), or (ii) the Shutdown Condition – Hot operating condition (Reactor mode switch is in "Shutdown" position and reactor coolant temperature is greater than 212°F), with the Shutdown Cooling (SDC) system not aligned for decay heat removal.

- Non-Power analysis for potential fires while in Shutdown Condition – Hot operating condition and lower operating conditions.

A copy of TS Section 1.1 containing the definitions of the NMP1 reactor operating conditions is provided in Figure SSD/CA RAI 01-1 below to facilitate a clear understanding of the analytical coverage provided by the two analyses described above.

1.0 DEFINITIONS

1.1 Reactor Operating Conditions

The various reactor operating conditions are defined below. Individual technical specifications amplify these definitions when appropriate.

a. Shutdown Condition - Cold

(1) The reactor mode switch is in the shutdown position or refuel position. *
(2) No core alterations leading to an addition of reactivity are being performed.
(3) Reactor coolant temperature is less than or equal to 212°F.

b. Shutdown Condition - Hot

(1) The reactor mode switch is in the shutdown position. **
(2) No core alterations leading to an addition of reactivity are being performed.
(3) Reactor coolant temperature is greater than 212°F.

c. Refueling Condition

(1) The reactor mode switch is in the refuel position.
(2) The reactor coolant temperature is less than 212°F.
(3) Fuel may be loaded or unloaded.
(4) No more than one operable control rod may be withdrawn.

d. Power Operating Condition

(1) Reactor mode switch is in startup or run position.
(2) Reactor is critical or criticality is possible due to control rod withdrawal.

e. Major Maintenance Condition

(1) No fuel is in the reactor.

* The reactor mode switch may be placed in the startup position to perform the shutdown margin demonstration. See Special Test Exception 3.7.1.

** The reactor mode switch may be placed in the refuel position to perform reactor coolant system pressure testing, control rod scram time testing and scram recovery operations.

Figure SSD/CA RAI 01-1: NMP1 Technical Specification Section 1.1, Definitions for Reactor Operating Conditions

The practical manifestation of the redefined basis for safe and stable is that the At-Power analysis now includes only equipment necessary to achieve and maintain hot shutdown conditions, including some new equipment required to demonstrate long-term hot shutdown capability. The NSCA no longer requires the ability to achieve and maintain cold shutdown. On this basis, equipment associated with the SDC system and any associated variances from deterministic requirements (VFDRs) of NFPA 805 Section 4.2.3 have been removed from the NSCA. Cold shutdown issues are now addressed only within the context of the Non-Power Operations (NPO) analysis, and only to the extent that they apply (refer to the response for Safe Shutdown / Circuit Analysis RAI 03). A formal screening process based on the criteria shown in Figure SSD/CA RAI 01-2 was used to screen and identify VFDRs associated only with the SDC system; i.e., cold shutdown only VFDRs.

1. If the credited HSD path is "C" or "D," as defined in EIR 51-9133191 (NMP1 NSCA), all VFDRs relevant to the fire area are required for long term "Safe and Stable" operation. Shutdown paths "C" and "D" utilize decay heat removal capabilities independent of the shutdown cooling system, and require the use of Core Spray (CS), Emergency Relief Valves (ERVs), and Containment Spray (CTS)/Containment Spray Raw Water (CTSRW) systems to assure appropriate HSD conditions.

2. The following criteria apply to the screening of VFDRs where the pertinent fire area HSD path is "A" or "B," as defined in EIR 51-9133191 (NMP1 NSCA). Shutdown paths "A" and "B" require the use of Emergency Condenser Cooling (supports HSD) and Shutdown Cooling (supports CSD). Thus, VFDRs may be removed if they are associated with only CSD operation.

   - VFDRs associated with systems or components required for initial plant inventory or pressure control are required for the "At-Power analysis." These systems include Emergency Condenser Cooling (EC), Main Feedwater Isolation, spurious ERV actuation, and Reactor Water Cleanup (RWCU) isolation. Note that the Control Rod Drive (CRD) System is required to ensure adequate Reactor Pressure Vessel (RPV) makeup is available to account for nominal inventory losses over time, thus VFDRS associated with availability of the system are required for the "At-power analysis." VFDRs associated with systems or components necessary to support vital plant diagnostic indication are required for the "At-Power analysis." These systems include Reactor Coolant System (RCS) pressure and level indication and torus level indication. Torus level indication is required because increasing torus level may reduce the available margin to transition to CSD and require operators to depressurize earlier in the event, thereby potentially jeopardizing the ability to maintain "stable" conditions while in HSD. Thus, scenarios that could impact the availability of torus level are required for the "At-Power analysis," such as spurious CTSRW Injection).

   - VFDRs associated with systems or components associated with Reactor Building Closed Loop Cooling, Emergency SW, or Normal SW availability are required for the "At-Power analysis." These systems are necessary to provide control room cooling, and thus must remain available prior to the transition to CSD.

   - VFDRs associated with electrical power availability are generally required for the "At-Power analysis" (e.g. Loss of Train A/B battery charging capability). Loss of individual power supplies are considered on a case-by-case basis, and are binned in accordance with the function of the equipment supported by the power supply.

   - VFDRs associated with the availability of HVAC units are generally required for the "At-Power analysis" unless the affected equipment/component supports a purely CSD function.

   - VFDRs associated with availability of the Shutdown Cooling System are required for CSD/NPO. Similarly VFDRs associated with Torus cooling are required for CSD/NPO. Torus cooling is not required for the "At-Power analysis" because EC cooling is the primary method for decay heat removal, and the system is not adversely impacted by a loss of torus cooling.

Figure SSD/CA RAI 01-2: Criteria for Screening and Identifying Cold Shutdown VFDRs

Changes to the NSCA and License Amendment Request (LAR) documentation necessary to implement the newly established safe and stable analysis basis include:

- Elimination of SDC system components from the NSCA equipment list. This change resulted in elimination of 73 VFDRs associated with cold shutdown (see Table SSD/CA RAI 01-1 for a list of removed cold shutdown VFDRs).

- Include in the NSCA the fire water system valves associated with refilling the Emergency Condenser makeup tanks to support long-term decay heat removal capability for hot shutdown operation. This change resulted in the addition of 22 new VFDRs (see Table SSD/CA RAI 01-2 for a list of new VFDRs).

- Addition of two new recovery actions associated with manual valve alignment and operation of the DFP to refill the Emergency Condenser makeup tanks to support long-term operation of the Emergency Cooling (EC) system, to satisfy decay heat removal requirements for hot shutdown.

- Re-quantification of the Fire PRA model and re-calculation of ΔCDF and ΔLERF. In both cases, slight improvements in risk were realized as a result of the changes (refer to LAR Attachments C and W for specific ΔCDF and ΔLERF values). Although delta risk decreased overall, there were slight increases in the contributions from recovery actions for ΔCDF and ΔLERF. This small increase is attributable to the reduction in reliance on SDC system components and increased reliance on the DFP and fire system valves for demonstrating that safe and stable conditions are achieved and maintained. The net effect makes the post-transition plant more like the deterministically compliant plant in terms of risk. The new approach to demonstrating safe and stable conditions results in a slight increase in reliance on recovery actions due to the addition of the two new recovery actions noted above.

- Updates to the following LAR Transition Report sections and attachments:

  - Update Section 4.2 to incorporate the new basis for safe and stable, including discussion on long-term maintenance of hot shutdown conditions (see Enclosures 3 and 4).

  - Update Table 4-3 to capture summary-level changes to the analysis (see Enclosures 3 and 4).

  - Update Attachment A (Table B-1), Section 3.5.16, to address the new time frame for alternate use of the DFP to refill the Emergency Condenser makeup tanks (see Enclosures 3 and 4).

  - Update Attachment B (Table B-2) to address the revised methodology for achieving and maintaining safe and stable conditions (see Enclosures 3 and 4).

  - Update Attachment C (Table B-3) to remove cold shutdown VFDRs, add new VFDRs associated with the DFP, and update the fire risk summary results (see Enclosures 5 and 6).

  - Update Attachment G to add new recovery actions associated with manual alignment and operation of the DFP to refill the Emergency Condenser makeup tanks (see Enclosures 3 and 4).

- Update the Attachment W Fire PRA insights and results to reflect re-quantification of the Fire PRA model and re-calculation of ΔCDF and ΔLERF values with the VFDR changes considered (see Enclosures 5 and 6).

Specific responses to Parts a through g of this RAI are provided below and are based on the revised safe and stable analysis basis. Thus, in some cases, the questions pertaining only to cold shutdown are no longer relevant.

Part a

Sustaining hot shutdown conditions (once achieved) for an extended period of time is accomplished by (1) ensuring a continual source of water to the Emergency Condensers in support of decay heat removal using the EC system, (2) ensuring a long-term source of inventory for makeup to the reactor, and (3) ensuring continual operation of at least one emergency diesel generator to supply AC power to the electrical distribution system.

Upon achieving hot shutdown conditions, the plant is able to maintain safe and stable operation for an extended period of time using the EC system. After 8 hours, the Emergency Condenser makeup tanks can be replenished as needed using the DFP, which draws water from Lake Ontario (effectively an infinite source). In the event water from the condensate storage tanks (CST) can be transferred to the Emergency Condenser makeup tanks, operation of the DFP would not be required until some point beyond 8 hours. Periodic refueling of the DFP is accomplished in accordance with existing plant procedures using the DFP fuel oil storage tank. The DFP day tank contains sufficient fuel for 17 hours of operation. The DFP fuel oil storage tank contains fuel to support 6.1 days of operation. Reactor coolant makeup is required after 8 hours, assuming a nominal TS leakage rate of 25 gpm. Makeup is provided via the Control Rod Drive (CRD) system using one of the CRD pumps drawing suction from the CST. Alternating current (AC) power is required to operate a CRD pump. The DFP may be aligned to provide reactor coolant makeup in the event that no CRD pump is available.

In the event the EC system is not available, the plant can be maintained in hot shutdown by opening three Electromatic Relief Valves (ERVs) in the automatic depressurization system (ADS) and blowing steam to the Torus to reduce pressure. When reactor pressure reaches approximately 365 psig, the Core Spray (CS) system may be utilized to provide core cooling. Both AC and direct current (DC) electrical power are required for this method of decay heat removal. This alternate means of decay heat removal can be used to maintain safe and stable conditions until such time that the SDC system is placed in service. The CS system is a two loop system. Operation of one loop is adequate to ensure core cooling. When utilizing the CS system, the ERVs pass steam and then, eventually, water to the Torus to remove decay heat from the reactor, in essence placing the Reactor Coolant System (RCS) in recirculation through the Torus. During this process, decay heat is removed by operation of the Containment Spray (CTS) system in conjunction with the Containment Spray Raw Water (CTSRW) system. This method of decay heat removal negates the need for another system to provide inventory makeup. AC power is required to initiate and maintain this method of decay heat removal; thus, long-term maintenance of this operating mode is dependent on maintaining AC electrical power.

For either of the hot shutdown methods used to achieve and maintain long-term safe and stable conditions, AC power availability from either the station Emergency Diesel Generators (EDGs) or offsite power is necessary. Offsite power is not credited in the NSCA. The EDGs can be refueled in

accordance with existing plant procedures using an on-site fuel source (tanker truck), until such time that offsite power is restored. Refueling of a continually operating EDG is estimated to be required after four days (assuming one EDG operating at full load). Given the long timeframe before EDG and/or DFP refueling is necessary, additional resources from the emergency response organization will be available to support EDG and DFP refueling activities.

Transition to cold shutdown is no longer a requirement in the NSCA for ensuring that safe and stable conditions are achieved and maintained.

Part b

Success in the Fire PRA is defined to be a controlled stable state with the reactor subcritical, its water inventory stable, and its heat being removed. The Fire PRA success criteria require that this stable condition be maintained for 24 hours; i.e., cold shutdown is not required for success in the Fire PRA. Nevertheless, some equipment that may be used to establish cold shutdown conditions is modeled in the Fire PRA; e.g., the SDC system is modeled in the Fire PRA to provide a backup to the loss of other heat removal systems.

The definition of safe and stable conditions for at-power analysis in LAR Section 4.2.1.2 is now revised to require achieving and maintaining hot shutdown conditions for an extended period of time, rather than to require achieving hot shutdown conditions and transitioning to cold shutdown. Some of the VFDRs originally presented in the LAR were identified as VFDRs only because they presented a challenge in meeting the nuclear safety performance criteria associated with achieving cold shutdown. Due to the elimination of the requirement for cold shutdown from the definition of safe and stable conditions, the cold-shutdown VFDRs have been eliminated (see listing in Table SSD/CA RAI 01-1). Thus, it is no longer necessary to evaluate the change in risk (ΔCDF and ΔLERF), including the risk of recovery actions, associated with cold-shutdown VFDRs.

Part c

The NMP1 NSCA (EIR 51-9133191) was developed in accordance with the NFPA 805 requirements and applicable Frequently Asked Questions (FAQs). Section 1.5.1 of NFPA 805 identifies the pertinent nuclear safety performance criteria that are to be satisfied in order to "provide reasonable assurance that, in the event of a fire, the plant is not placed in an unrecoverable condition." The criteria are:

- Reactivity Control
- Inventory and Pressure Control
- Decay Heat Removal
- Vital Auxiliaries
- Process Monitoring

LAR Attachment C (Table B-3) documents how each performance criteria is satisfied on a fire area basis. When applicable, VFDRs are identified for each performance goal in Table B-3 and a disposition is provided. The revised NMP1 basis for safe and stable requires that hot shutdown conditions be achieved and maintained for an extended period of time, which introduces additional

system capacity limitations to ensure that the nuclear safety performance criteria are satisfied. The additional capacity limitations include:

- A source of inventory makeup to the Emergency Condensers to ensure availability of the EC system for extended hot shutdown operation.
- A source of inventory makeup to the reactor to compensate for primary system leakage over an extended time frame. Reactor inventory makeup was addressed originally as a cold shutdown consideration, whereas the revised NMP1 basis for safe and stable could require that inventory makeup be established prior to the cold shutdown transition.
- A source of fuel oil to assure long-term availability of the EDGs and DFP.

The response to Part a of this RAI provides details for these three identified long-term considerations. Additional VFDRs (applicable to the pertinent fire areas) have been added to LAR Attachment C (Table B-3) to address deterministic concerns regarding availability of the Fire Water System. Specifically, local start of the DFP is addressed by plant procedure N1-OP-21A. The procedure also address actions necessary to replenish fuel oil to the DFP, thereby ensuring adequate fuel oil supply, and other actions necessary to ensure pump operation if instrument air is not available. Procedure N1-PM-V19 provides guidance to replenish the EDG fuel oil storage tank to assure continued long-term operation of the EDGs.

Time-critical actions needed to support capacity limitations involve load shedding for Battery Boards 11 and 12 to ensure DC power availability. These actions are included in Table G-1 of LAR Attachment G.

Part d

Recovery actions credited in the NFPA 805 transition to bring the plant to and maintain it in a safe and stable condition (i.e., hot shutdown) fall into one of two categories, as follows:

- Recovery actions modeled in the Fire PRA and analyzed as part of the human reliability analysis (HRA) of the Fire PRA. Appendix I of the Human Reliability Analysis (HRA) Fire PRA notebook (N1-HRA-F001) provides feasibility evaluations for the recovery actions modeled in the Fire PRA that are used to resolve VFDRs identified in the NSCA. The feasibility evaluations are performed separately for each of the 17 recovery actions identified for analysis considering the 11 criteria from FAQ 07-0030 (demonstrations, systems and indications, communications, emergency lighting, tools, procedures, staffing, actions in the fire area, time, training, and drills).
- Recovery actions not modeled in the Fire PRA and whose additional risk was found to be insignificant based on a qualitative evaluation. The feasibilities of these recovery actions are evaluated in EIR 51-9156521.

The recovery action feasibilities were evaluated using the 11 criteria given in FAQ 07-0030, which include, among others, staffing and timing requirements. All recovery actions credited in the NFPA 805 transition were found to meet the feasibility criteria of FAQ 07-0030. Operator impacts and staffing considerations for the long-term safe and stable actions have been included in the updated

analysis. Actions required to achieve and initially maintain hot shutdown conditions can be performed by the minimum shift complement of reactor operators, senior reactor operators, and non-licensed plant operators. As discussed in the response to Part a of the RAI, EDG and DFP refueling activities do not occur for several days, are proceduralized, and can be implemented by emergency response organization personnel.

Operator actions modeled in the Fire PRA (including those that are not recovery actions) were evaluated for their feasibility and reliability as part of the development of their human error probability (HEP). This evaluation was documented in N1-HRA-F001 and relied on guidance from NUREG/CR-6850/EPRI TR-1011989, NUREG-1792, NUREG-1852, and the ASME/ANS PRA standard.

The recovery actions that were previously credited in the fire risk evaluations to reduce the risk contribution from cold shutdown VFDRs are removed. These recovery actions are no longer required to demonstrate that safe and stable conditions can be maintained. Recovery actions for the SDC system that are included in the Fire PRA as a means of reducing risk are retained.

Part e

The recovery actions involving local repairs to valve and pump wiring for the SDC system have been removed from LAR Attachment G. These recovery actions are associated with VFDRs pertaining to cold shutdown activities and are no longer required to demonstrate that safe and stable conditions (redefined as hot shutdown) can be maintained. The VFDRs associated with these repair actions have been removed from the NSCA.

Part f

The risk of failure of operator actions and equipment necessary to sustain safe and stable conditions is evaluated in the models developed for the Fire PRA, since safe and stable conditions have been redefined as hot shutdown and the Fire PRA covers hot shutdown conditions.

Changes to the Fire PRA to implement the newly established safe and stable basis for the At-Power analysis involve credit for the DFP and two new operator recovery actions. The recovery actions are associated with manual valve alignment and local operation of the DFP to refill the Emergency Condenser makeup tanks in support of long-term operation of the EC system to satisfy decay heat removal requirements for hot shutdown.

The Fire PRA models are quantified to determine the fire-induced core damage frequency (CDF) and large early release frequency (LERF). These risk metrics are used in the fire risk evaluations (FREs), consistent with Regulatory Guides 1.205 and 1.174.

The Fire PRA also supports the FREs by ensuring that the risk inherent to each fire area is properly captured and that the set of recovery actions credited for the NFPA 805 transition is appropriately characterized, including the evaluation of their additional risk. LAR Attachment G is therefore amended to address the removal of SDC recovery actions and the addition of the DFP and associated valve-related recovery actions.

Updates to the LAR Attachment W Fire PRA insights and results reflect the Fire PRA re-quantification values generated for the revised safe and stable basis.

Part g

Multiple Spurious Operations (MSOs) associated with the SDC system are not addressed in the NSCA per the revised NMP1 basis for safe and stable operation. As a result, VFDRs originally associated with the SDC system have been removed from the NSCA analysis.

The NPO analysis (documented in EIR 51-9137629 and 51-9171174) identifies equipment that must remain functional to satisfy a particular Key Safety Function (KSF) success path. These KSF success paths were developed in accordance with the guidance in FAQ-07-0040, wherein higher risk evolutions (HRE) drive the selection of KSF success paths (including decay heat removal) based on time to boil. The NPO analysis provides recommendations to best manage fire risk for "pinch points" (areas of the plant where complete loss of a KSF may occur due to fire).

A number of MSO scenarios associated with the SDC system are identified in the NMP1 Expert Panel MSO Report, "Technical Report on Identification & Classification of the NMP-1 MSO Scenarios using an Expert Panel – Review of New Generic Scenarios," dated May 2012. These scenarios are all addressed within the context of the SDC KSFs (1DHR-RX-SDC), as documented in the NMP1 NPO KSF Equipment List (EIR 51-9137629). There is one KSF identified for each train of the SDC system. Accordingly, pinch points associated with the availability of these KSFs are identified in the NMP1 NPO Component Pinch Point Analysis (EIR 51-9171174). Recommendations to best manage fire risk for each scenario pinch point are also described in EIR 51-9171174 (Appendix B) and are summarized in the response to Safe Shutdown / Circuit Analysis RAI 03 (see Table SSD/CA RAI 03-2).

The response to Safe Shutdown / Circuit Analysis RAI 03 addresses specific aspects of the NMP1 NPO analysis, including the treatment of MSOs.

Table SSD/CA RAI 01-1: Cold Shutdown VFDRs Eliminated from Table B-3

Fire Area	Fire Area Description	VFDR ID	VFDR Title	Details	Comments
04	Foam Room, el. 261	VFDR-04-005	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
04	Foam Room, el. 261	VFDR-04-006	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-09 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-09. (PC031, OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
04	Foam Room, el. 261	VFDR-04-007	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-10 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-10. (PC031, OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
04	Foam Room, el. 261	VFDR-04-008	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-11 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-11. (PC031,OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
05	Turbine Building, el. 240 to 369	VFDR-05-020	Loss of Instrument Air	A deterministic assumption assumes potential loss of instrument air. RBCLC to SDC Flow control valve BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53 (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
05	Turbine Building, el. 240 to 369	VFDR-05-021	Loss of Instrument Air	A deterministic assumption assumes for potential loss of instrument air. SDC heat exchanger outlet flow control valve FCV-38-10 may fail closed on loss of instrument air. Valve is required open for cold shutdown (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
05	Turbine Building, el. 240 to 369	VFDR-05-025	Spurious Operation of Shutdown Cooling System Valves IV-38-01 and IV-38-13	A separation concern exists for postulated fire in this area for the loss of PB-167 due to an uncoordinated associated emergency lighting circuit. Non SSD Emergency Lighting 11 is supplied by cable 167-101 from 600V Power Board 167, Breaker H01. The emergency lighting power cable 167-101 supply breaker H01 does not coordinate with PB-167 supply breaker. Fire damage to cable 167-101 could cause the loss of PB-167 preventing operation of Reactor Shutdown Cooling Isolation Valves, IV-38-01 and IV-38-13 as directed in repair procedure N1-DRP-005. (OP019)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
05	Turbine Building, el. 240 to 369	VFDR-05-044	Unavailability of Shutdown Cooling Valve BV-38-04	A postulated fire in this area may damage cable 171-41 adversely affecting credited SDC valve BV-38-04. SDC is required to support the decay heat removal function. Local-Manual operation of BV-38-04 per N1-SOP-21.1 may be required. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
05	Turbine Building, el. 240 to 369	VFDR-05-045	Unavailability of Shutdown Cooling Valve IV-38-02	A postulated fire in this area may damage cable 12DV-10, 12DV-11, 12DV-29, 12DV-9 or 167-11 adversely affecting credited SDC valve IV-38-02. SDC is required to support the decay heat removal function. Local-Manual operation of IV-38-02 per N1-SOP-21.1 may be required. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.

Table SSD/CA RAI 01-1: Cold Shutdown VFDRs Eliminated from Table B-3

Fire Area	Fire Area Description	VFDR ID	VFDR Title	Details	Comments
06	Turbine Building North, el. 250	VFDR-06-013	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. Flow control valve BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
06	Turbine Building North, el. 250	VFDR-06-014	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. SDC heat exchanger outlet flow control valve FCV-38-11 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-11. (OMC001,PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
06	Turbine Building North, el. 250	VFDR-06-015	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. SDC heat exchanger outlet flow control valve FCV-38-09 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-09. (OMC001,PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
06	Turbine Building North, el. 250	VFDR-06-018	Unavailability of Shutdown Cooling Valve IV-38-02	A postulated fire in this area may result in the loss of Train 12 power adversely affecting credited SDC valve IV-38-02. SDC is required to support the decay heat removal function. Local-Manual operation of IV-38-02 per N1-SOP-21.1 may be required. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
07	Turbine Building South & West, el. 250	VFDR-07-003	Unavailability of Shutdown Cooling Pump PMP-38-152	A separation concern exists for a postulated fire in the area for shutdown cooling. Credited pump, PMP-38-152, is required to operate to support decay heat removal. Fire damage to cable 17-62 can prevent remote start of the credited SDC pump due to loss of RCS Temperature Switch permissive. Local breaker operation is required. (OP010A, OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
07	Turbine Building South & West, el. 250	VFDR-07-009	Loss of Instrument Air	A deterministic assumption assumes a potential loss of instrument air for a fire in any area of the plant. BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53 locally to supply RBCLC water to the SDC heat exchanger. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
07	Turbine Building South & West, el. 250	VFDR-07-010	Loss of Instrument Air	A deterministic assumption assumes a potential loss of instrument air for a fire in any area of the plant FCV-38-10 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-10 locally to control SDC cooldown. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
09	Turbine Building East, el. 250	VFDR-09-013	Loss of Instrument Air	A deterministic assumption assumes a potential loss of instrument air for a fire in any fire area of the plant. Flow control valve BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A recovery action may be required to open valve BV-70-53 locally to supply RBCLC water to SDC heat exchanger. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
09	Turbine Building East, el. 250	VFDR-09-014	Loss of Instrument Air	A deterministic assumption assumes a potential loss of instrument air for a fire in any fire area of the plant. SDC heat exchanger outlet flow control valve FCV-38-11 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-11 (PC031, OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.

Table SSD/CA RAI 01-1: Cold Shutdown VFDRs Eliminated from Table B-3

Fire Area	Fire Area Description	VFDR ID	VFDR Title	Details	Comments
09	Turbine Building East, el. 250	VFDR-09-015	Loss of Instrument Air	A deterministic assumption assumes a potential loss of instrument air for a fire in any fire area of the plant. SDC heat exchanger outlet flow control valve FCV-38-09 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-09 (PC031, OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
09	Turbine Building East, el. 250	VFDR-09-021	Unavailability of Shutdown Cooling Valve IV-38-02	A postulated fire in this area may result in the loss of Train 12 power adversely affecting credited SDC valve IV-38-02. SDC is required to support the decay heat removal function. Local-Manual operation of IV-38-02 per N1-SOP-21.1 may be required. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
10	Cable Spreading Room, el. 250-0	VFDR-10-011	Failure of Shutdown Cooling System Valve IV-38-01 To Open	A separation concern exists for a postulated fire in this area for the Shutdown Cooling system. SDC valve IV-38-01 is required open for CSD to support decay heat removal. Fire damage (ground) to cable 12DV-29 prevents SDC IV-38-01 from opening. When power is restored to the valve and the control switch operated, the control circuit fuse will blow due to a dead short across the CPT. The EC's will attempt to initiate automatically on either high reactor pressure or low-low reactor level. However, both paths of EC's may be adversely impacted by the following: Potential inventory losses via the Main Steam Lines and EC vent and drain lines discussed above(OP039, OP048)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
10	Cable Spreading Room, el. 250-0	VFDR-10-019	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53 locally to supply RBCLC water to SDC heat exchangers. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
10	Cable Spreading Room, el. 250-0	VFDR-10-020	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-09 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-09 locally to control SDC cooldown. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
10	Cable Spreading Room, el. 250-0	VFDR-10-026	Unavailability of Shutdown Cooling Pump PMP-38-149	A postulated fire in this area may damage cable 16-34 adversely impacting credited SDC pump PMP-38-149. PMP-38-149 is required to support decay heat removal. SDC PMP-38-149 is repaired and operated locally at PB 16 per N1-DRP-GEN-003, Attachment 6. (PC037)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
10	Cable Spreading Room, el. 250-0	VFDR-10-027	Unavailability of Shutdown Cooling Valve IV-38-02	A postulated fire in this area may damage cable 12DV-11 or 12DV-29 adversely affecting credited SDC valve IV-38-02. SDC is required to support the decay heat removal function. Local-Manual operation of IV-38-02 per N1-SOP-21.1 may be required. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.

Table SSD/CA RAI 01-1: Cold Shutdown VFDRs Eliminated from Table B-3

Fire Area	Fire Area Description	VFDR ID	VFDR Title	Details	Comments
11	Control Complex, el. 261 and el. 277	VFDR-11-012	Unavailability of Shutdown Cooling Pump PMP-38-152	A separation concern exists for a postulated fire in this area for shutdown cooling. Credited SDC pump, PMP-38-152, is required to support decay heat removal for CSD. The credited SDC pump, PMP-38-152, may spuriously start and run with no suction source. SDC pump PMP-38-152 may spuriously start due to an internal wire-to-wire short on cable 17-23. SDC isolation valve IV-38-01 has power removed to prevent spurious opening for a fire in this fire area. SDC valves IV-38-02 and BV-38-04 are normally closed. Min-flow recirc valve FCV-38-131 may remain closed due to an internal wire-to-wire short on cable 1K-4. In the event the credited SDC pump is not available or other equipment operation causes a vessel overfill rendering EC's unavailable , various circuit failures in Train 11 and 12 CS valves could render the CS system unavailable for vessel injection and heat removal (OP044, OP026)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
11	Control Complex, el. 261 and el. 277	VFDR-11-016	Loss of Instrument Air	A deterministic assumption assumes a potential loss of instrument air. Block Valve, BV-70-53 may fail closed on loss of instrument air. This Valve is required to be open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70- 53 (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
11	Control Complex, el. 261 and el. 277	VFDR-11-024	Unavailability of Power Board PB 167	A postulated fire in this area may cause the loss of PB 167 due to damage to the following Train 11 component cables: BKR-(16B/013B)R1043/603: Cable 16-3 BKR-(102/2-9)R1021/171: Cables 101-6, 102-2, 11B-10 BKR-(102/2-1)R1022/571: Cables 101-6, 102-22, 102-28, 102-29, 102-30, 102-31, 102-43, 102-44, 102-45, 102-46, 102-49, 102-67, 11B-28, 1A-124, 1A-147, 1B-126, 1S-2386 BKR-(101/2B-1)R1012/151: Cables 101-6, 11B-28, 1A-147, 1A-60 In support of shutdown from outside the control room, power is realigned from Train 12 to PB 167 per N1-DRP-GEN-004, Attachment 4. (PC044)	This VFDR is associated with a power supply recovery action to assure availability of the SDC system. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
11	Control Complex, el. 261 and el. 277	VFDR-11-028	Unavailability of Shutdown Cooling Valve IV-38-01	A postulated fire in this area may result in misoperation of credited SDC isolation valve IV-38-01 due to fire damage to cable 167-11 or 167-12. To support meeting the decay heat removal function, SDC valve IV-38-01 is repaired and operated from PB 167 per N1-DRP-GEN-004, Attachment 15. (PC049)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
11	Control Complex, el. 261 and el. 277	VFDR-11-029	Unavailability of Shutdown Cooling Valve IV-38-13	A postulated fire in this area may result in misoperation of credited SDC isolation valve IV-38-13 due to fire damage to cable 167-15 or 167-16. To support meeting the decay heat removal function, SDC valve IV-38-13 is repaired and operated from PB 167 per N1-DRP-GEN-004, Attachment 16. (PC050)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
11	Control Complex, el. 261 and el. 277	VFDR-11-035	Manual Operation of Shutdown Cooling Valves BV-38-04, FCV-38-10, and IV-38-02	In support of shutdown from outside the control room and the decay heat removal performance function, SDC valves BV-38-04, FCV-38-10 and IV-38-02 are operated locally per N1-DRP-GEN-004, Attachment 12, Attachment 13 or Attachment 14. (PC048)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
12	Administration Building, el. 250.0	VFDR-12-005	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.

Table SSD/CA RAI 01-1: Cold Shutdown VFDRs Eliminated from Table B-3

Fire Area	Fire Area Description	VFDR ID	VFDR Title	Details	Comments
12	Administration Building, el. 250.0	VFDR-12-006	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-09 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-09. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
12	Administration Building, el. 250.0	VFDR-12-007	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-10 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-10. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
12	Administration Building, el. 250.0	VFDR-12-008	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-11 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-11. (OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
13	Screenhouse	VFDR-13-005	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. FCV-38-09 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-09 (PC031, OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
13	Screenhouse	VFDR-13-006	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. FCV-38-10 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-10 (PC031, OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
13	Screenhouse	VFDR-13-007	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. FCV-38-11 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-11. (PC031, OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
13	Screenhouse	VFDR-13-008	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53 (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
14	Diesel Fire pump Room, el. 261	VFDR-14-005	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
14	Diesel Fire pump Room, el. 261	VFDR-14-006	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. FCV-38-09 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-09. (PC031,OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
14	Diesel Fire pump Room, el. 261	VFDR-14-007	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. FCV-38-10 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-10. (PC031, OMH001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.

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Fire Area	Fire Area Description	VFDR ID	VFDR Title	Details	Comments
14	Diesel Fire pump Room, el. 261	VFDR-14-008	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. FCV-38-11 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-11. (PC031,OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
15	Radwaste and Waste Disposal Buildings, el. 252 to 292	VFDR-15-005	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
15	Radwaste and Waste Disposal Buildings, el. 252 to 292	VFDR-15-006	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-09 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-09.(PC031, OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
15	Radwaste and Waste Disposal Buildings, el. 252 to 292	VFDR-15-007	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-10 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-10.(PC031, OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
15	Radwaste and Waste Disposal Buildings, el. 252 to 292	VFDR-15-008	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-11 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-11.(PC031, OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
16A	Battery Board Room 12, el. 261	VFDR-16A-005	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. FCV-38-09 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-09. (PC031, OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
16A	Battery Board Room 12, el. 261	VFDR-16A-006	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. FCV-38-11 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-11. (PC031, OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
16A	Battery Board Room 12, el. 261	VFDR-16A-007	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
16A	Battery Board Room 12, el. 261	VFDR-16A-008	Unavailability of Shutdown Cooling Valve IV-38-02	Due to the unavailability of EDG 103 (Train 12, Path B), power is not available to motor operated valve IV-38-02. IV-38-02 is a normally closed valve that fails as-is on loss of power. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve IV-38-02. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
16B	Battery Board Room 11, el. 261	VFDR-16B-005	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. FCV-38-10 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-10. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.

Table SSD/CA RAI 01-1: Cold Shutdown VFDRs Eliminated from Table B-3

Fire Area	Fire Area Description	VFDR ID	VFDR Title	Details	Comments
16B	Battery Board Room 11, el. 261	VFDR-16B-006	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
17A	Battery Room 12, el. 277 to 291	VFDR-17A-005	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. FCV-38-09 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-09.	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
17A	Battery Room 12, el. 277 to 291	VFDR-17A-006	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. FCV-38-11 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-11.	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
17A	Battery Room 12, el. 277 to 291	VFDR-17A-007	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53.	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
17A	Battery Room 12, el. 277 to 291	VFDR-17A-008	Unavailability of Shutdown Cooling Valve IV-38-02	Due to the unavailability of EDG 103 (Train 12, Path B), power is not available to motor operated valve IV-38-02. IV-38-02 is a normally closed valve that fails as-is on loss of power. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve IV-38-02.	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
17B	Battery Room 11, el. 277 to 291	VFDR-17B-005	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. FCV-38-10 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-10. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
17B	Battery Room 11, el. 277 to 291	VFDR-17B-006	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air for a fire in any fire area of the plant. BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
18	Emergency Diesel Generator 102 Missile Enclosure, el. 271	VFDR-18-007	Flow Diversion from Containment Spray Raw Water System to Containment Spray System	A spurious actuation concern exists impacting valves FCV-93-74 and FCV-93-73 by diverting flow due to wire-to-wire shorts on the following cables. An internal wire-to-wire short on cable 171-163 spuriously opens FCV-93-74 diverting CTSRW flow to the CS system. (OP035) An internal wire-to-wire short on cable 171-160 spuriously opens FCV-93-73 diverting CTSRW flow to the CTS system. (OP034)	This VFDR is associated only with operation of the CTS/CTRWS, which provides torus cooling. Torus cooling is required to support CSD, and is not necessary when the primary decay heat removal method is achieved via the EC's. On this basis, the VFDR is eliminated
19	Diesel Generator Room 103, el. 250	VFDR-19-003	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
19	Diesel Generator Room 103, el. 250	VFDR-19-004	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-11 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-11. (OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.

Table SSD/CA RAI 01-1: Cold Shutdown VFDRs Eliminated from Table B-3

Fire Area	Fire Area Description	VFDR ID	VFDR Title	Details	Comments
19	Diesel Generator Room 103, el. 250	VFDR-19-005	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-09 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-09. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
19	Diesel Generator Room 103, el. 250	VFDR-19-006	Unavailability of Shutdown Cooling Valve IV-38-02	Due to the unavailability of EDG 103 (Train 12, Path B), power is not available to motor operated valve IV-38-02. IV-38-02 is a normally closed valve that fails as-is on loss of power. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve IV-38-02. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
20	Diesel Generator Enclosed Cableway, el. 250	VFDR-20-001	Unavailability of Shutdown Cooling Valve IV-38-02	Due to the unavailability of EDG 103 (Train 12, Path B), power is not available to motor operated valve IV-38-02. IV-38-02 is a normally closed valve that fails as-is on loss of power. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve IV-38-02. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
20	Diesel Generator Enclosed Cableway, el. 250	VFDR-20-004	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
20	Diesel Generator Enclosed Cableway, el. 250	VFDR-20-005	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-11 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-11. (OMC001)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
20	Diesel Generator Enclosed Cableway, el. 250	VFDR-20-006	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-09 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-09. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
21	Below Power Boards 102/103, el. 250	VFDR-21-001	Unavailability of Shutdown Cooling Valve IV-38-02	Due to the unavailability of EDG 103 (Train 12, Path B), power is not available to motor operated valve IV-38-02. IV-38-02 is a normally closed valve that fails as-is on loss of power. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve IV-38-02. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
21	Below Power Boards 102/103, el. 250	VFDR-21-004	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. BV-70-53 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve BV-70-53. (PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
21	Below Power Boards 102/103, el. 250	VFDR-21-005	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-11 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-11. (OMC001, PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.
21	Below Power Boards 102/103, el. 250	VFDR-21-006	Loss of Instrument Air	A deterministic assumption exists for potential loss of instrument air. FCV-38-09 may fail closed on loss of instrument air. Valve is required open for cold shutdown to support decay heat removal. A Recovery Action may be required to open valve FCV-38-09.(OMC001,PC031)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.

Table SSD/CA RAI 01-1: Cold Shutdown VFDRs Eliminated from Table B-3

Fire Area	Fire Area Description	VFDR ID	VFDR Title	Details	Comments
22	Emergency Diesel Generator 102 Foundation Room, el. 250 and Diesel Generator Room, el. 261	VFDR-22-006	Flow Diversion from Containment Spray Raw Water System to Containment Spray System	A separation concern exists for a postulated fire in the area for the Containment Spray Raw Water system. CTSRW is required to support the decay heat removal function. Both loops of the credited secondary decay heat removal function can be lost. An internal wire-to-wire short on cable 171-163 spuriously opens FCV-93-74 diverting flow from pump PMP-93-03 to the CS system. An internal wire-to-wire short on cable 171-160 spuriously opens FCV-93-73 diverting flow from pump PMP-93-04 to the CTS system. Diversion of the CTSRW flow paths away from the CTSRW heat exchangers results in a loss of Decay Heat Removal. (OP034, OP035)	This VFDR is associated only with operation of the Shutdown Cooling System. The Shutdown Cooling System is only required to support CSD. On this basis, the VFDR is eliminated from the NSCA and will be addressed in the NPO analysis.

Table SSD/CA RAI 01-2: New VFDRs Added to Table B-3 to Support Extended Hot Shutdown Operation

Fire Area	VFDR ID	VFDR Title	Details	Comments
04	VFDR-04-009	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
05	VFDR-05-047	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
06	VFDR-06-019	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
07	VFDR-07-014	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
09	VFDR-09-022	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
10	VFDR-10-029	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.

Table SSD/CA RAI 01-2: New VFDRs Added to Table B-3 to Support Extended Hot Shutdown Operation

Fire Area	VFDR ID	VFDR Title	Details	Comments
11	VFDR-11-037	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
12	VFDR-12-009	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
13	VFDR-13-011	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
14	VFDR-14-009	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
15	VFDR-15-009	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
16A	VFDR-16A-009	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.

Table SSD/CA RAI 01-2: New VFDRs Added to Table B-3 to Support Extended Hot Shutdown Operation

Fire Area	VFDR ID	VFDR Title	Details	Comments
16B	VFDR-16B-007	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
17A	VFDR-17A-009	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
17B	VFDR-17B-007	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
18	VFDR-18-011	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
19	VFDR-19-007	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
20	VFDR-20-008	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.

Table SSD/CA RAI 01-2: New VFDRs Added to Table B-3 to Support Extended Hot Shutdown Operation

Fire Area	VFDR ID	VFDR Title	Details	Comments
21	VFDR-21-008	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
22	VFDR-22-008	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
23	VFDR-23-008	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.
24	VFDR-24-007	Long-Term EC Make-up Tank Water Supply	The Emergency Condensers (ECs) are credited for establishing long-term decay heat removal to maintain plant HSD conditions. After a period of 8 hours following the initiation of plant shutdown, inventory makeup from the Fire Protection Water System to the EC makeup water tanks is necessary to assure continued availability of the EC System. Valves 100-68 (loop 111 and 112) and 100-69 (loop 121 and 122) are normally closed manual valves , and are both required open to periodically refill the EC condenser makeup tanks. Additionally, availability of the Diesel Driven Fire Pump (DFP) from the Main Control Room is not assured.	This VFDR is associated with inventory makeup to the Emergency Condenser Makeup Tanks. After a period of 8 hours makeup is needed from the Fire Protection System to assure long-term availability of the EC system. On this basis, this VFDR is classified a HSD VFDR.

Safe Shutdown / Circuit Analysis RAI 03

LAR Section 4.3 and Attachment D describe the methods and results of the non-power operations (NPO) evaluation, including references to the applicable outage programs, procedures, and NPO analyses. Additional information is requested as follows:

a. *Provide "Appendix B: NMP1 NPO Pinch Point Assessment" in the NPO fire area reviews including a summary level identification of unavailable paths in each fire area and the resolution for each pinch point.*

b. *During NPO modes, spurious actuation of valves can have a significant impact on the ability to maintain decay heat removal and inventory control. Provide a description of any actions being credited to minimize the impact of fire-induced spurious actuations on power operated valves (e.g., air operated valves (AOVs) and motor operated valves (MOVs)) during NPO either as pre-fire conditioning or as required during the fire response recovery (e.g., pre-fire rack-out, locally pinning of valves, and isolation of air supplies).*

   For example, it appears to the NRC staff that the Technical Specifications (TS) allow the shutdown cooling isolation valves 38-01 and 38-13 to be inoperable in the open position for greater than 4 hours under certain specific conditions. During higher risk evolutions such as a short time to boil, preventing the spurious closure of any of these valves would be advantageous. Provide justification for not invoking the TS allowed flexibility for maintaining these valves open during higher risk evolutions (HREs).

c. *Identify locations where key safety functions (KSFs) are achieved via RAs or for which instrumentation not already included in the at-power analysis is needed to support RAs required to maintain safe and stable conditions. Identify those RAs and instrumentation relied upon in NPO and describe how RA feasibility is evaluated. Include in the description whether these variables have been or will be factored into operator procedures supporting these actions.*

   For instance, during outage conditions when there is a short time to boil, describe the operator response to a spurious closure of one of the shutdown cooling system motor operated isolation valves 38-01 or 38-13. Describe how any RAs are feasible (e.g., can be reliably accomplished in the available time frame).

Response to Safe Shutdown / Circuit Analysis RAI 03

General

The following is background information and other details of the non-power operations (NPO) analysis that form the baseline for the specific responses to Parts a through c of this RAI.

NMPNS has elected to modify its NFPA 805 transition analysis for NMP1 to revise the approach for demonstrating the ability to reach and maintain safe and stable conditions, as specified by NFPA 805. The original Nuclear Safety Capability Assessment (NSCA) established as its basis for demonstrating safe and stable conditions the requirement to maintain $K_{eff} < 0.99$ with a reactor coolant temperature at or below the requirements for hot shutdown and then subsequently cool down and maintain the plant in a cold

shutdown condition. Consistent with NFPA 805 and supplemental guidance, NMPNS is revising its basis for the NMP1 NSCA to include only the requirement to establish hot shutdown conditions, including long-term hot shutdown capability. The impact of this change is primarily limited to the NSCA, which is addressed in the response to Safe Shutdown / Circuit Analysis RAI 01. The change to safe and stable conditions does not impact the NPO Plant Operating States (POSs), Key Safety Functions (KSFs), or pinch point analysis. Hence, the response to this RAI does not depend on results or conclusions described in the response to Safe Shutdown / Circuit Analysis RAI 01.

As discussed in the response to Safe Shutdown / Circuit Analysis RAI 01, demonstration of the nuclear safety performance criteria for safe and stable conditions is performed in two analyses based on the plant operating modes, as defined in the NMP1 TS. These analyses are defined as follows:

- At-Power analysis for potential fires while in either: (i) the Power Operating Condition (Reactor mode switch is in "Startup" or "Run" position and the reactor is critical or criticality is possible due to control rod withdrawal), or (ii) the Shutdown Condition – Hot operating condition (Reactor mode switch is in "Shutdown" position and reactor coolant temperature is greater than 212°F), with the Shutdown Cooling (SDC) system not aligned for decay heat removal. (Refer to the response to Safe Shutdown / Circuit Analysis RAI 01 for further discussion of this analysis and its results.)

- Non-Power analysis for potential fires while in Shutdown Condition – Hot operating condition and lower operating conditions.

A copy of TS Section 1.1 containing the definitions of the NMP1 reactor operating conditions is provided as Figure SSD/CA RAI 01-1 in the response to Safe Shutdown / Circuit Analysis RAI 01. Table SSD/CA RAI 03-1 below provides a correlation between the three POSs identified in FAQ 07-0040 and plant operating modes defined in the NMP1 TS. Note that the reference to "RHR" in the FAQ 07-0040 descriptions of POS is analogous to the SDC system at NMP1.

Table SSD/CA RAI 03-1: POS to TS Operating Condition Correlation

POS Number and Description (from FAQ 07-0040)		NMP1 TS Operating Condition and Description	
POS 1	▪ This POS starts when the RHR system is placed into service. ▪ The vessel head is on and the RCS is closed such that an extended loss of the decay heat removal (DHR) function without operator intervention could result in a RCS re-pressurization above the shutoff head for the RHR pumps.	Shutdown Condition - Hot Shutdown Condition - Cold	▪ Reactor mode switch is in "Shutdown" or "Refueling" position ▪ No core alterations leading to an addition of reactivity are being performed ▪ Reactor coolant temperature is greater than 212°F (Hot) or equal to or less than 212°F (Cold)
POS 2	This POS represents the shutdown condition when: (1) The vessel head is removed and reactor pressure vessel water level is less than the minimum level required for movement of irradiated fuel assemblies within the reactor pressure vessel as defined by Technical Specifications, OR (2) A sufficient RCS vent path exists for decay heat removal.	Major Maintenance Condition	No fuel is in the Reactor
POS 3	▪ This POS represents the shutdown condition when the reactor pressure vessel water level is equal or greater than the minimum level required for movement of irradiated fuel assemblies within the reactor pressure vessel as define by Technical Specifications ▪ This POS occurs during Mode 5	Refueling Condition	▪ Reactor mode switch is in "Refueling" position ▪ Fuel may be loaded or unloaded ▪ Reactor coolant temperature is less than 212°F ▪ No more than one operable control rod is withdrawn

As described in LAR Attachment D, procedure NIP-OUT-01, "Shutdown Safety," defines higher risk evolutions (HREs) and establishes KSFs and defense-in-depth (DID) strategies to protect the KSFs. HREs are defined as:

> "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 or the number of key safety systems drops below the shutdown safety criteria."

NIP-OUT-01 ensures that HREs are identified and communicated to plant personnel with applicable precautions and / or contingency plans clearly identified; e.g., on the Outage Schedule Shutdown Safety Review (SSR) reports. KSFs considered for HREs, as required by NIP-OUT-01, include:

1. **Decay Heat Removal Capability**. Assessments for maintenance activities affecting decay heat removal capability should consider that the ability of systems and components to remove decay heat is dependent on a variety of factors, including the plant configuration, availability of other key safety systems and components, and the ability of operators to diagnose and respond properly to an event. For example, assessment of maintenance activities that impact the decay heat removal key safety function should consider:

    - Initial magnitude of decay heat.
    - Time to boil.
    - Time to core uncover.
    - Initial RCS water inventory condition (for example, filled, reduced, reactor cavity flooded, etc.).
    - RCS configurations (for example, reactor vessel open/closed, recirculation nozzle plugs installed or loop isolation valves closed, vent paths available, temporary covers installed, main steam line plugs installed, etc.).

    When any fuel is offloaded to the spent fuel pool during the refueling outage, the decay heat removal function will be at least partially shifted from the RCS to the spent fuel pool (SFP). When the core is completely offloaded with the SFP gates installed, the decay heat removal function in the RCS can be marked "Not Applicable."

2. **Inventory Control.** Assessments for maintenance activities should address the potential for creating inventory loss flow paths in both the RCS and the SFP. For example:

    - Maintenance activities associated with the main steam lines (for example, safety or relief valve removal, automatic depressurization system testing, main steam isolation valve maintenance, and so forth) can create a drain down path for the reactor cavity and fuel pool. This potential is significantly mitigated through the use of main steam plugs.

    When the core is completely offloaded with the SFP gates installed, the reactor Inventory Control function can be marked "Not Applicable."

3. **Power Availability**. Assessments should consider the impact of maintenance activities on availability of electrical power. Electrical power is required during shutdown conditions to maintain cooling to the reactor core and the SFP, to transfer decay heat to the heat sink, to achieve containment closure when needed, and to support other important functions.

    - Assessments for maintenance activities involving AC power sources and distribution systems should address providing defense in depth that is commensurate with the plant operating mode or configuration.
    - Assessments for maintenance activities involving the switchyard and transformer yard should consider the impact on offsite power availability.

- AC and DC instrumentation and control power is required to support systems that provide key safety functions during shutdown. As such, maintenance activities affecting power sources, inverters, or distribution systems should consider their functionality as an important element in providing appropriate defense in depth.

4. **Reactivity Control**. The main aspect of this key safety function involves maintaining adequate shutdown margin in the reactor core and the SFP. During periods of cold weather, RCS temperatures can also decrease below the minimum value assumed in the shutdown margin calculation. When in power operation or startup conditions, availability of the Liquid Poison system must be considered.

KSFs identified in NIP-OUT-01 associated with POSs specifically excluded from consideration by FAQ 07-0040 are not discussed in the response to this RAI.

Updates to Section 4.3 and Attachment F of the LAR Transition Report that are associated with the response to this RAI are provided in Enclosures 3 and 4.

Part a

Table SSD/CA RAI 03-2 below, from EIR 51-9171174, Appendix B – NMP1 NPO Pinch Point Assessment, provides summary level identification of KSF losses and pinch points on a fire zone basis. The table identifies each KSF associated with a pinch point and the recommendations for addressing the pinch points.

As described in Section 4.3 and Attachment D of the LAR, the following KSFs are evaluated in each fire zone:

- Decay Heat Removal (DHR) for both the Reactor Vessel (RX) and the Spent Fuel Pool (SFP).
- Inventory Control (INV) for both the Reactor Vessel and the Spent Fuel Pool.
- Power (PWR) availability.

The Reactivity Control KSF is not included in the NPO analysis because it is administratively controlled in accordance with procedure NIP-OUT-01.

Referring to Table SSD/CA RAI 03-2, the KSFs are categorized with codes assigned to each KSF – Fire Zone pair. Three codes have been established to summarize the fire impacts:

- "I" (Impacted): At least one of the KSF paths associated with a given KSF is affected; i.e., a component of a specific KSF path or any of the component's required cables within the fire zone are impacted, whereby that path can no longer be assured of being functional. However, at least one other KSF path for the KSF remains available.
- "L" (Lost): All available success paths for a given KSF are impacted.
- "N" (None): No impacts to the KSF are identified.

"Pinch Points" are then identified (on a fire zone basis), based on the loss of a KSF. An "N" in the pinch point column of Table SSD/CA RAI 03-2 indicates that no KSFs are lost in this fire zone. A "Y" in this column indicates that one or more KSFs are potentially lost in the fire zone, and therefore a pinch point is considered to exist. Fire zones are then categorized as follows:

- Category 1 fire zones are not pinch points as they were found to have at least one success path for each KSF. No recommendations for additional fire protection measures during HREs are made for these zones. Standard DID strategies, as specified by procedure NIP-OUT-01, "Shutdown Safety," are adequate to address risk.

- Category 2 fire zones are pinch points as every success path is potentially lost for at least one KSF. These KSF success paths can be preserved through fire protection/fire prevention actions, including the verification of functionality of available fire detection and suppression during HREs.

FAQ 07-0040 provides a listing of standard fire risk management methods that have been found to be acceptable for managing fire risk during HREs. During periods of NPO that are not defined as HREs, the standard fire protection DID actions are considered sufficient to minimize fire risk. During HREs, recommendations from FAQ 07-0040 have been identified for additional measures to consider as part of a comprehensive program to reduce fire risk. Each Category 2 fire zone includes one or more recommendations from the list provided in Table SSD/CA RAI 03-3 to minimize fire risk to the KSFs, as described in Table SSD/CA RAI 03-2. Note that Recommendations 2B, 4, 6, and 7 from FAQ 07-0040 are not used.

Table SSD/CA RAI 03-2: Summary Level Identification of KSF Losses and Pinch Points (from EIR 51-9171174, Appendix B – NMP1 NPO Pinch Point Assessment)

Fire Zone	Fire Area	Fire Zone Description	KSFs Lost or Impacted					Pinch Point ?	Category	Recommendations (from Table SSD/CA RAI 03-3)	Suppression	Detection
			DHR		INV		PWR					
			RX	SFP	RX	SFP						
A1	NA	ADMINISTRATION BUILDING EL 250-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
A2	NA	ADMINISTRATION BUILDING EL 248-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
AB1A	12	RECORDS STORAGE AREA EL 250--0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB1B	12	SAS EQUIPMENT AREA EL 252-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB1C	12	CPU EQUIPMENT AREA EL 252-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
AB1D	12	GENERAL AREA EL 250-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
AB1E	12	LOCKER AREA, LUNCH ROOM, OFFICES EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB1F	4	FOAM ROOM EL 261-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
AB2A	12	ACCESS PASSAGEWAY EL 248-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB2B	12	TECHNICAL SUPPORT AREA EL 248-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB2C	12	RADIATION RECORDS AREA EL 248-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB2D	12	WAREHOUSE AREA EL 248-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB3A	12	WAREHOUSE AREA EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB3B	12	OIL STORAGE ROOM EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB3C	12	STOREROOM TRUCK DOCK EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB3D	12	ELECTRICAL/MECHANICAL SHOP AREA, OFFICE AREAS, LOCKER ROOMS EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		

Fire Zone	Fire Area	Fire Zone Description	KSFs Lost or Impacted					Pinch Point ?	Category	Recommendations (from Table SSD/CA RAI 03-3)	Suppression	Detection
			DHR		INV		PWR					
			RX	SFP	RX	SFP						
AB3E	12	TELEPHONE ROOM 1 EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB3F	12	TELEPHONE ROOM 2 EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB4A	12	GENERAL OFFICE AREA EL 277-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB4B	12	FILE ROOM EL 277-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB4C	12	RECORDS PROCESSING AREA EL 277-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB4D	12	GENERAL OFFICE AREA EL 277-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
AB5	12	PENTHOUSE VENTILATION ROOM EL 290-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
B1A	16A	BATTERY BOARD ROOM 12 EL 261-0	I	L	L	L	I	Y	2	1A and/or 3B and/or 5	None	Yes
B1B	16B	BATTERY BOARD ROOM 11 EL 261-0	I	L	L	I	I	Y	2	1A and/or 3B and/or 5	None	Yes
B2A	17A	BATTERY ROOM 12 EL 277-0	I	L	L	L	I	Y	2	1A and/or 3B and/or 5	None	Yes
B2B	17B	BATTERY ROOM 11 EL 277-0	I	L	L	I	I	Y	2	1A and/or 3B and/or 5	None	Yes
C1	10	CABLE SPREADING ROOM EL 250-0	L	L	L	L	L	Y	2	1A and/or 2A and/or 3A	Yes	Yes
C2	11	AUXILIARY CONTROL ROOM, COMPUTER ROOM 261-0	L	L	L	L	L	Y	2	1A and/or 2A and/or 3A and/or 5	Yes	Yes
C3	11	CONTROL ROOM EL 277-0	L	L	L	L	L	Y	2	9	Yes	Yes
D1A	19	EDG 103 FOUNDATION ROOM EL 250-0	I	L	I	L	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes
D1B	22	EDG 102 FOUNDATION ROOM EL 250-0	I	L	L	I	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes
D1C	20	EDG 103 CABLE ROUTING AREA EL 250-0	I	L	L	L	L	Y	2	1A and/or 2A and/or 3A	Yes	Yes
D1D	21	ROOM BELOW PB'S 102 & 103 EL 250-0	I	L	L	L	L	Y	2	1A and/or 2A and/or 3A	Yes	Yes
D2A	19	EDG 103 ROOM EL 261-0	I	L	I	L	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes

Fire Zone	Fire Area	Fire Zone Description	KSFs Lost or Impacted					Pinch Point ?	Category	Recommendations (from Table SSD/CA RAI 03-3)	Suppression	Detection
			DHR		INV		PWR					
			RX	SFP	RX	SFP						
D2B	22	EDG 102 ROOM EL 261-0	L	L	L	L	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes
D2C	23	POWER BOARD 102 ROOM EL 261-0	L	L	L	L	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes
D2D	24	POWER BOARD 103 ROOM EL 261-0	L	L	L	L	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes
D3	18	EDG 102 CONTROL CABLE MISSILE ENCLOSURE EL 271--0	L	L	L	L	I	Y	2	1A and/or 5	None	Yes
EXT	EXT	EXTERNAL TO PLANT	L	L	L	L	L	Y	2	1A and/or 2A and/or 3A and/or 10	Yes	Yes
F1	4	FOAM ROOM EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
FBZ-1	1	REACTOR BUILDING FIRE BREAK ZONE	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
FBZ-2	2	REACTOR BUILDING FIRE BREAK ZONE	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
FBZR237N-1	1	REACTOR BUILDING EL 237-0 COL N-Q, ROW 8-9	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
FBZR237N-2	2	REACTOR BUILDING EL 237-0 COL N-Q, ROW 8-9	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
FBZR261N-1	1	REACTOR BUILDING EL 261-0 COL N-Q, ROW 8-9	L	L	I	I	I	Y	2	1A and/or 3B and/or 5	Yes	None
FBZR261N-2	2	REACTOR BUILDING EL 261-0 COL N-Q, ROW 8-9	L	L	I	I	I	Y	2	1A and/or 3B and/or 5	Yes	None
FBZR281N-1	1	REACTOR BUILDING EL 281-0 COL M-Q, ROW 6-7	L	L	I	I	I	Y	2	1A and/or 3B and/or 5	Yes	None
FBZR281N-2	2	REACTOR BUILDING EL 281-0 COL M-Q, ROW 6-7	L	L	I	I	I	Y	2	1A and/or 3B and/or 5	Yes	None
FBZR281S-1	1	REACTOR BUILDING EL 281-0 COL K-L, ROW 7-8	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
FBZR281S-2	2	REACTOR BUILDING EL 281-0 COL K-L, ROW 7-8	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
FBZR298N-1	1	REACTOR BUILDING EL 298-0 COL N-Q, ROW 7.5-8.5	I	I	I	I	I	N	1	Not a pinch point. No action needed.		

Fire Zone	Fire Area	Fire Zone Description	KSFs Lost or Impacted					Pinch Point ?	Category	Recommendations (from Table SSD/CA RAI 03-3)	Suppression	Detection
			DHR		INV		PWR					
			RX	SFP	RX	SFP						
FBZR298N-2	2	REACTOR BUILDING EL 298-0 COL N-Q, ROW 7.5-8.5	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
FBZR298S-1	1	REACTOR BUILDING EL 298-0 COL K-L, ROW 7-8	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
FBZR298S-2	2	REACTOR BUILDING EL 298-0 COL K-L, ROW 7-8	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
FBZR318N-1	1	REACTOR BUILDING EL 318-0 COL M-Q, ROW 6-7	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
FBZR318N-2	2	REACTOR BUILDING EL 318-0 COL M-Q, ROW 6-7	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
FBZR318S-1	1	REACTOR BUILDING EL 318-0 COL K-M, ROW 6-7	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
FBZR318S-2	2	REACTOR BUILDING EL 318-0 COL K-M, ROW 6-7	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
FBZR340N-1	1	REACTOR BUILDING EL 340-0 COL M-Q, ROW 6-7	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
FBZR340N-2	2	REACTOR BUILDING EL 340-0 COL M-Q, ROW 6-7	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
FBZR340S-1	1	REACTOR BUILDING EL 340-0 COL L-N, ROW 7-8	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
FBZR340S-2	2	REACTOR BUILDING EL 340-0 COL L-N, ROW 7-8	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
FBZT261N	5	TURBINE BUILDING FIRE BREAK ZONE NORTH EL 261-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
FBZT261S	5	TURBINE BUILDING FIRE BREAK ZONE SOUTH EL 261-0	L	L	L	L	L	Y	2	1B and/or 3B and/or 5 and/or 8	None	None
OG1	5	GENERAL FLOOR AREA EL 232-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
OG2	5	GENERAL FLOOR AREA EL 247-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
OG3	5	GENERAL FLOOR AREA EL 261-0	I	L	I	L	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes

Fire Zone	Fire Area	Fire Zone Description	KSFs Lost or Impacted					Pinch Point ?	Category	Recommendations (from Table SSD/CA RAI 03-3)	Suppression	Detection
			DHR		INV		PWR					
			RX	SFP	RX	SFP						
R1	3	DRYWELL EL 237 - 318	I	I	L	I	I	Y	2	1B and/or 3B and/or 5	None	None
R1A	1	CTS PUMP ROOM AND GENERAL FLOOR AREA EAST EL 198-0 & 237-0	I	L	L	L	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes
R1B	2	CTS PUMP ROOM, CS PUMP ROOM, GENERAL FLOOR AREA WEST EL 198-0 & 237-0	L	L	L	I	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes
R1C	1	ACCESS STAIRWELL SOUTHEAST EL 237-0 & 261-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
R1D	1	CS PUMP ROOM AND PROTECTIVE CLOTHING CHANGE AREA EL 198-0 & 237-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
R2A	1	GENERAL FLOOR AREA EAST EL 261-0	L	L	L	L	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes
R2B	2	GENERAL FLOOR AREA WEST EL 261-0	L	L	L	I	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes
R2C	2	SHUTDOWN COOLING ROOM EL 261-0	I	L	L	I	I	Y	2	1A and/or 3B and/or 5	Yes	Yes
R2D	2	REACTOR BUILDING TRACK BAY EL 261-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
R3A	1	GENERAL FLOOR AREA EAST EL 281-0	L	L	L	L	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes
R3B	2	GENERAL FLOOR AREA WEST EL 281-0	I	L	L	I	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes
R4A	1	GENERAL FLOOR AREA EAST EL 298-0	L	L	I	L	I	Y	2	1A and/or 3B and/or 5	None	Yes
R4B	2	GENERAL FLOOR AREA WEST EL 298-0	L	L	I	I	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes
R4C-1	1	EMERGENCY CONDENSER ISOLATION VALVE ROOM EL 298-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		

Fire Zone	Fire Area	Fire Zone Description	KSFs Lost or Impacted					Pinch Point ?	Category	Recommendations (from Table SSD/CA RAI 03-3)	Suppression	Detection
			DHR		INV		PWR					
			RX	SFP	RX	SFP						
R4C-2	2	EMERGENCY CONDENSER ISOLATION VALVE ROOM EL 298-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
R5A	1	GENERAL FLOOR AREA EAST EL 318-0	I	L	I	L	I	Y	2	1A and/or 3B and/or 5	None	Yes
R5B	2	GENERAL FLOOR AREA WEST EL 318-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
R6A	1	GENERAL FLOOR AREA EAST EL 340-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
R6B	2	GENERAL FLOOR AREA WEST EL 340-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
RS1A	15	DRUM WASTE STORAGE VAULTS EL 252-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
RS1B	15	ELECTRICAL EQUIPMENT ROOM EL 252-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
RS1C	15	GENERAL FLOOR AREA SOUTH, DRUM STORAGE ROOM EL 252-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
RS2A	15	TRUCK LOADING AREA, NORTH EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
RS2B	15	TRUCK LOADING AREA, WEST EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
RS2C	15	GENERAL FLOOR AREA EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
RS2D	15	RADWASTE CONTROL ROOM, WEST EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
RS2E	15	GENERAL FLOOR AREA, SOUTH EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
RS3A	15	GENERAL FLOOR AREA, WEST EL 281-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
RS4A	15	GENERAL FLOOR AREA, NORTHWEST EL 292-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		

Fire Zone	Fire Area	Fire Zone Description	KSFs Lost or Impacted					Pinch Point ?	Category	Recommendations (from Table SSD/CA RAI 03-3)	Suppression	Detection
			DHR		INV		PWR					
			RX	SFP	RX	SFP						
RS5B	15	GENERAL FLOOR AREA, SOUTHWEST EL 292-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
S1	13	SCREENHOUSE EL 225-0 - 256-0	I	L	I	I	I	Y	2	1A and/or 3B and/or 5	None	Yes
S2	14	DIESEL FIRE PUMP ROOM EL 256-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
T1	5	TURBINE CONDENSER/HEATER BAY AREA EL 250-0	I	I	I	L	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes
T1A	5	TURBINE BUILDING EL 240-261 MSIV ROOM & STEAM TUNNEL	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
T2A	6	TURBINE BUILDING EL 250-0	L	L	L	L	L	Y	2	1A and/or 2A and/or 3A	Yes	Yes
T2B	7	TURBINE BUILDING SOUTH AND WEST EL 250-0	L	L	L	L	L	Y	2	1A and/or 2A and/or 3A	Yes	Yes
T2C	9	TURBINE BUILDING OFFGAS TUNNEL EL 250-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
T2D	9	TURBINE BUILDING GENERAL AREA EAST EL 250-0	L	L	L	L	L	Y	2	1A and/or 2A and/or 3A	Yes	Yes
T2E	7	UPS BATTERY ROOM EL 250	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
T3A	5	GENERAL FLOOR AREA EAST OF MSIV ROOM AND FIRE ZONE T1 EL 261-318	L	L	L	L	L	Y	2	1A and/or 2A and/or 3A	Yes	Yes
T3B	5	GENERAL FLOOR AREA WEST OF MSIV ROOM; ALSO SOUTH AND WEST OF FIRE ZONE 1 EL 237-0 & 261-0	L	L	L	L	L	Y	2	1A and/or 2A and/or 3A	Yes	Yes
T4A	5	GENERAL FLOOR AREA EAST OF FIRE ZONE T1 EL 277-0	L	L	L	L	L	Y	2	1A and/or 2A and/or 3A	Yes	Yes
T4B	5	GENERAL FLOOR AREA WEST OF FIRE ZONE T1 EL 277-0	L	L	L	L	L	Y	2	1A and/or 2A and/or 3A	Yes	Yes
T4C	5	HYDROGEN SEAL OIL UNIT ROOM EL 277-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
T4D	5	BATTERY ROOM EL 277	I	I	I	I	I	N	1	Not a pinch point. No action needed.		

Fire Zone	Fire Area	Fire Zone Description	KSFs Lost or Impacted					Pinch Point ?	Category	Recommendations (from Table SSD/CA RAI 03-3)	Suppression	Detection
			DHR		INV		PWR					
			RX	SFP	RX	SFP						
T5A	5	GENERAL FLOOR AREA NORTH EL 291-0	I	L	I	L	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes
T6A	5	GENERAL FLOOR AREA NORTH EL 305-6	I	L	I	L	I	Y	2	1A and/or 2A and/or 3A	Yes	Yes
T6B	5	TURBINE LAYDOWN AREA EAST EL 300-0	I	L	I	L	I	Y	2	1A and/or 5	None	Yes
T6C	5	GENERAL FLOOR AREA SOUTH EL 300-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
T6D	5	MECHANICAL STORAGE AREA EL 320-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
T7A	5	GENERAL FLOOR AREA SOUTH EL 320-0	I	L	I	L	I	Y	2	1A and/or 3B and/or 5	None	Yes
T8A	5	GENERAL FLOOR AREA NORTH EL 333-0, GENERAL FLOOR AREA NORTH EL 351-0, GENERAL FLOOR AREA EAST EL 369	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
T8B	5	GENERAL FLOOR AREA WEST EL 369-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
WD1	15	GENERAL AREA El 225-0 & 229-0	I	I	I	I	I	N	1	Not a pinch point. No action needed.		
WD2	15	GENERAL AREA EL 247-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
WD3A	15	GENERAL AREA EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
WD3B	15	RADWASTE CONTROL ROOM EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
WD3C	15	BALER ROOM EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
WD3D	15	DOW SOLIDIFICATION AREA EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
WD3E	15	TRUCK BAY EL 261-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		
WD4	15	WASTE BUILDING VENTILATION AREA EL 277-0	N	N	N	N	N	N	1	Not a pinch point. No action needed.		

Table SSD/CA RAI 03-3: List of Recommendations for Identified Pinch Points (from FAQ 07-0040)

No.	FAQ 07-0040 Recommendation	NMP1 Specific Recommendation for Category 2 Fire Zones		Outage Planning Considerations
1	Prohibition or limitation of hot work in fire areas during periods of increased vulnerability.	1A	Limit hot work in this fire zone during HRE conditions.	Outage planning considers periods of increased vulnerability for limiting hot work in this fire zone.
		1B	Prohibit hot work in this fire zone during HREs.	Outage planning considers periods of increased vulnerability for prohibiting hot work in this fire zone.
2	Verification of operable detection and /or suppression in the vulnerable areas.	2A	Verify that the available fire detection systems located in the fire zone are functional. Post firewatch in affected fire zones prior to entering HRE conditions if system(s) are impaired.	Detection systems should be verified to be functional; i.e., not tagged out, etc.
		2B*	Verify that the available fire suppression systems located in the area are functional. Post firewatch in affected fire zones prior to entering HRE conditions if system(s) are impaired.	Suppression systems should be verified to be functional; i.e., not tagged out.
3	Prohibition or limitation of combustible materials in fire areas during periods of increased vulnerability.	3A	Limit transient combustible storage in this fire zone during HRE conditions.	Outage planning considers limiting the hazard of combustible materials.
		3B	Prohibit transient combustible storage in this fire zone during HRE conditions.	Outage planning considers prohibiting the hazard of combustible materials.
4*	Plant configuration changes (e.g., removing power from equipment once it is placed in its desired position).	Power can be removed from various components and equipment as part of outage configuration line-ups prior to entering HRE conditions.		Outage planning considers using alternate equipment and/or the equipment's position whenever removing power.
5	Provision of additional fire patrols at periodic intervals or other appropriate compensatory measures (such as surveillance cameras) during increased vulnerability.	Provide a firewatch (continuous or periodic) in this fire area during HRE conditions.		Outage planning considers the appropriate compensatory measures required during periods of increased vulnerability.
6*	Use of recovery actions to mitigate potential losses of KSFs.	Recovery actions to restore at least one KSF success path can be taken.		Activities that may impact KSFs should be limited and strictly controlled to mitigate losses.

No.	FAQ 07-0040 Recommendation	NMP1 Specific Recommendation for Category 2 Fire Zones	Outage Planning Considerations
7*	Identification and monitoring in-situ ignition sources for "fire precursors" (e.g., equipment temperatures).		Outage planning considers the hazards from the introduction of combustible materials and sources of fire precursors.
8	Reschedule the work to a period with lower risk or higher defense in depth (DID).	Activities in these fire zones should be rescheduled to a period of non-HRE conditions.	Outage planning considers limiting work during periods of HRE conditions.
9	N/A	Control Rooms are constantly manned locations. No other actions are required during HRE conditions.	N/A
10	N/A	Existing controls on switchyard activities during HRE conditions are adequate and will manage fire risk as well.	N/A

* These recommendations are not used.

Part b

The NMP1 NPO pinch point analysis was developed in accordance with the guidance contained in FAQ 07-0040. The FAQ 07-0040 endorsed "Recommendations" utilized at NMP1 to reduce fire risk during HREs are identified in Part a of this RAI response. The additional reduction in risk offered by the "Recommended" strategies provides additional assurance that fire risk is minimized in areas susceptible to a loss of one or more KSFs during plant HREs.

As discussed in the response to Part a and depicted in Table SSD/CA RAI 03-2, additional actions (e.g., pre-fire rack-out, locally pinning of valves, isolation of air supplies) are not relied upon as a strategy to reduce fire risk during HREs, including the impact of fire-induced spurious operations (single or multiple). The assessment of potential risk reduction options (including input from Operations personnel) concluded that the actual additional risk posed by fire during HREs is best controlled through the methods identified in Table SSD/CA RAI 03-2. Specifically, the NMP1 NPO strategy does not credit the following methods:

- Recovery Actions – Reliance on recovery actions during an outage is difficult to characterize for feasibility due to the many variables that could exist, such as blockage of normal routes, scaffolding impact on lighting, equipment/material staging and movement, contract personnel contingent, unusual equipment line ups, etc. For this reason, recovery actions are viewed as less predictable with respect to reliability and uncertainty in comparison to the risk reduction options selected.

- Configuration Changes – The use of limited configuration changes to address in a preemptive manner certain high consequence fire-induced failures, most notably spurious operations of key valves, was considered. However, after discussions with Operations personnel it was concluded

that the reduction in operational flexibility to respond to a broader range of potential accidents and abnormal conditions outweighs the marginal improvement in risk reduction associated with fire-induced spurious operations.

With specific reference to the potential vulnerability of shutdown cooling isolation valves 38-01, 38-02, and 38-13 to fire-induced spurious closure, deliberately entering a TS required action was evaluated as undesirable when viewed from a broader perspective beyond just potential fire events. Thus, the recommendations contained in Table SSD/CA RAI 03-2 are considered the best options to augment existing procedures for managing shutdown risk, including risk from fire, during HREs.

Part c

As shown in the response to Part a and in Table SSD/CA RAI 03-2, NMP1 does not credit recovery actions as a strategy to reduce shutdown fire risk during HREs. The rationale for not employing recovery actions is provided in the response to Part b above.

Safe Shutdown / Circuit Analysis RAI 07

Based on a review of the updated final safety analysis report (UFSAR), switchgear other than motor control centers (MCCs) use 125 VDC power for control of the electrically-operated circuit breakers so the breakers may be operated if AC power is lost. Dual feeds are provided to the DC control bus on each power board for added reliability, one each from either battery 11, 12 or 14.

A generic concern in regards to the Fort Calhoun fire that occurred on June 7, 2011 (NRC Special Inspection Report, March 12, 2012, ADAMS Accession No. ML12072A128) involves 125 VDC circuits from both DC buses inside the same switchgear. Both DC buses were impacted with "soft" grounds that remained after the fire had been isolated by removing power.

With respect to the Fort Calhoun event, it appears that the power boards at NMP1 have dual control power feeds. Describe if this issue has been considered. Describe if there are any proposed plans to perform modifications or procedure changes to address this issue.

Response to Safe Shutdown / Circuit Analysis RAI 07

General Description of the NMP1 125 VDC System

The safety related 125 VDC system at NMP1 consists of two physically separate and independent trains (Batteries 11 and 12). Each train includes one 125 VDC station battery, two parallel static battery chargers (one primary and the other a backup), and one DC power distribution board. The battery boards include the fuses and the fuse blocks required for distribution of 125V DC to various system loads. The augmented quality 125 VDC system consists of one 125 VDC station battery (Battery 14), a static battery charger, and one DC power distribution battery board.

The 125 VDC batteries 11, 12, and 14 are part of NMP1 Safe Shutdown Equipment. Battery 11 and the associated battery board are located in Fire Areas 17B and 16B, respectively. Battery 12 and the associated battery board are located in Fire Areas 17A and 16A, respectively. Battery 14 and the associated battery board are located in Fire Area 5.

Ground Detection Design Features

The 125 VDC electrical distribution trains are operated independently and ungrounded, and, as such, a single ground does not generate a fault current or disable the system. The system is equipped with ground detection devices to indicate the occurrence of the first ground which allows operators to locate and correct the first ground. NRC Information Notice (IN) 94-80 "Inadequate DC Ground Detection in Direct Current Distribution Systems," alerted licensees to the potential for operating with undetectable grounds in vital direct current (DC) distribution systems due to inadequate ground-detection equipment or inadequate ground-alarm setpoints, or both. The IN recommended that ground detectors be incorporated in the DC systems so that, if a single ground does occur, personnel are aware of the ground and can take immediate steps to clear the ground from the system. Failure to promptly eliminate a single ground could mask subsequent additional grounds. Multiple grounds could lead to unpredictable spurious operation of equipment, inoperable equipment, unanalyzed loads on batteries, or unanalyzed equipment failure modes. In response IN 94-80, the 125 VDC system ground detection scheme at NMP1 was modified.

A ground on the 125 VDC power system will be determined by the Ground Detection Relay and annunciated in the Control Room at panel A3 windows A3-4-2 for Battery 11, A3-4-3 for Battery 12, and A3-2-2 for Battery 14. Alarm Response Procedure N1-ARP-A3 directs operators to Operating Procedure N1-OP-47A (125 VDC System), Section H.8.0, which provides direction to locate and clear a ground within the 125 VDC system.

System Loads Configuration

For added reliability, dual DC feeds are provided to a number of Power Boards, Emergency Diesel Generators (EDGs) 102 and 103, and the Diesel Fire Pump (DFP). The dual feeds are selected via a mechanically operated knife switch located at each load and aligned to the normal DC feed. Table SSD/CA RAI 07-1 below provides a summary of loads with dual feeds.

Table SSD/CA RAI 07-1: 125 VDC Electrical Distribution System Dual Feed Loads on Battery Boards 11, 12, and 14

Battery Board Load	Battery Board #11	Battery Board #12	Battery Board #14
Motor Generator (MG) Set 167	Normal	Alternate	
Breaker Control - Power Board 11	Normal	Alternate	
Breaker Control - Power Board 12	Alternate	Normal	
Breaker Control - Power Board 13	Alternate		Normal
Breaker Control - Power Board 14	Alternate	Normal	
Breaker Control - Power Board 15	Alternate		Normal
Breaker Control - Power Board 16	Normal	Alternate	
Breaker Control - Power Board 17	Alternate	Normal	
Breaker Control - Power Board 18	Alternate		Normal
Breaker Control - Power Board 101	Normal	Alternate	
Breaker Control - Power Board 102	Normal	Alternate	
Breaker Control - Power Board 103	Alternate	Normal	
DC Valve Board 11	Normal	Alternate	
DC Valve Board 12	Alternate	Normal	
Diesel Fire Pump	Normal		Alternate
Hydrogen and Seal Oil System Annunciation	Alternate		Normal
Stator Water System Annunciation	Alternate		Normal
Emergency Diesel Generator 102 Starting and Control	Normal	Alternate	
Emergency Diesel Generator 103 Starting and Control	Alternate	Normal	

NMP1 Electrical Maintenance Procedures for Breakers and Switchgear

As documented in the NRC Special Inspection Report 05000285/2011014 (Accession No. ML12072A128), the fire at Fort Calhoun Station occurred due to a high impedance connection which caused failure of a 480 VAC Breaker. The high impedance connection was caused by hardened grease on the secondary disconnects and dirty secondary contacts in GE model AKD-5 low voltage switchgear. The root cause analysis determined that the electrical maintenance procedure associated with the low voltage switchgear was less than adequate, that preventive maintenance activities were inadequate to ensure proper cleaning of conductors, proper torquing of bolted conductor and bus bar connections, and that inspections for abnormal temperatures were inadequate.

At NMP1, procedure N1-EPM-GEN-310 implements preventive maintenance on 4.16KV Switchgear, 600VAC Switchgear, 600 and 480 VAC Motor Control Centers (MCCs), and 125 VDC Battery Power Boards. Attachments 1 and 2 of this procedure include specific steps which address the issues identified in the Fort Calhoun root cause analysis, as follows:

- When maintaining GE AKD-5 Load Master Switchgear, the breaker primary disconnecting studs and fingers are cleaned and greased with a thin coat of Mobil 28. Mobil 28 is selected based on its performance characteristics, which include resistance to friction oxidation (fretting) and hardening under various environmental conditions.

- Inspect bolted connections, and torque any loose connections in accordance with specific torque requirements.

Procedure N1-EPM-GEN-151 for the inspection of TYPE AK-50 and ITE K-LINE breakers includes the following precautions and steps:

- Prevent the mixing of Mobil 28 with previously used GE D50H15 or GE D50H47 lubricants since it may result in grease hardening and breaker failure.

- Inspect main, intermediate, and arcing movable and stationary contacts for discoloration that may have been caused by overheating.

Procedure N1-EPM-GEN-182 for the inspection of MCCs includes the following precaution:

- To prevent component insulation degradation, Trichloroethane (CRC Lectra Clean) based solvents shall not be used on the component insulating parts of the MCC or MCC Bucket. Denatured and isopropyl alcohol are acceptable substitutes for cleaning/degreasing of component insulated parts. THC-based solvents may be used for cleaning/degreasing of current carrying parts in metallic MCCs as well as on metallic MCC bucket components.

A review of past Condition Reports associated with breakers and breaker maintenance at Nine Mile Point was performed to determine if there has been any Condition Reports initiated due hardening of grease, dirty contacts, or loose connections. The following provides a summary of this review:

Condition Report	Description
1994-000170	OE – Misadjustment between GE 4.16 KV circuit breakers and their associated cubicles
2000-003715	OE 11485, Cleaning of silver contacts caused silver to be removed
2001-001049	INPO SEN 218, Circuit breaker fault results in fire, LOOP, Reactor scram, and severe turbine damage
2001-004474	INPO SEN 221, Circuit Breaker to Bus Connector Faults Results in Reactor Scram. The corrective actions associated with this CR included revisions to Electrical Preventive Maintenance procedures N1-EPM-GEN-150 and N1-EPM-GEN-310 to incorporate steps/precautions to not use abrasive cleaner when cleaning silver plated contact surfaces.
2003-001128	GE Service Information Letter 448, Rev.1, Recommendation for lubrication of Type AK GE Breakers
2004-001184	Catastrophic Failure of MCCB 19A in 2NHS-MCC010 due to phase-to-ground fault near line side connection. A corrective action of this Condition Report implemented procedure revisions to include specific steps and directions for inspection of MCCB line side power wiring (procedures N1-EPM-GEN-182 and 310).

The above Condition Reports and the associated corrective actions have resulted in procedure changes that address the potential causes of the fire event at Fort Calhoun.

Differences Between NMP1 and Fort Calhoun

In addition to lack of adequate preventive maintenance, the NRC Special Inspection Report 05000285/2011014 identified two addition contributing causes to the overall event at Fort Calhoun, as follows:

- Implementation of a plant modification in 2009 that replaced AK-50 480 V main and bus-tie breakers with Molded Case Square-D Masterpact circuit breaker/cradle assemblies and digital trip devices. The differences in form, fit, and function resulted in high resistance connections between the cradle assembly and bus stabs due to oxidation built-up caused by dissimilar metal (copper and silver) which contributed to the fire.

  There has been no modification implemented at NMP1 to replace breakers with the type identified above.

- Unlike Fort Calhoun, the NMP1 DC feeds to power boards, EDGs, and the DFP are equipped with fuses. These fuses function to effectively clear and isolate the affected battery board from an overcurrent condition caused by a hot short or multiple shorts to ground.

Analysis of the Postulated Fire Scenario at NMP1

A circuit analysis for the NMP1 NFPA 805 transition was performed in accordance with NEI 00-01, Revision 2, which has been endorsed by Regulatory Guide (RG) 1.189, Revision 2. In accordance with the guidance provided in NEI 00-01, Revision 2, evaluation of a potential "soft" ground (i.e.; a ground that does not result in sufficient fault current to cause the circuit protective/isolation device to open) is not required. The following are excerpts from NEI 00-01, Section 3.5, with respect to ungrounded circuits:

- In the case of an ungrounded circuit, postulating only a single short-to-ground on any part of the circuit may not result in tripping the electrical protective device. Another short-to-ground on the circuit or another circuit from the same source would need to exist to cause a loss of control power to the circuit.

- Consider an individual, single short-to-ground on each conductor in each affected cable in a grounded circuit. Consider the combined effects of shorts-to-ground if conductors are located in the same multi-conductor cable in the primary circuit.

- For ungrounded circuits, two shorts-to-ground are required for the loss of control power to the individual circuit. The recommended approach either assumes or evaluates for a second short-to-ground causing a loss of control power in the components control circuit for ungrounded circuits.

- Additionally, either assume a second short-to-ground exists in an ungrounded circuit resulting in a loss of control power or evaluate for an actual fire-induced cable impact with the potential to cause the second short-to-ground in the fire area.

- Depending on the coordination characteristics between the protective device on the circuit and upstream circuits, the power supply to other circuits could be affected. If multiple grounds can occur in a single fire area, they should be assumed to occur simultaneously unless justification to the contrary is provided.

In summary, the concern with respect to a postulated short to ground on an ungrounded DC control circuit is multiple fire induced grounds that could result in a loss of control capability due to opening of the isolation devices.

Similar to Fort Calhoun Station, NMP1 125 V DC battery boards 11, 12, and 14 provide redundant control power to a number of power boards, EDG 102 and 103 start and control circuits, and the DFP, as listed in Table SSD/CA RAI 07-1. A mechanically operated transfer switch allows the operators to manually re-align control power from the normal to the alternate 125 VDC battery board. The battery board loads listed in Table SSD/CA RAI 07-1 are located in Fire Areas 1, 2, 4, 5, 14, 19, 22, 23, and 24. The NMP1 Nuclear Safety Capability Assessment (NSCA) for the above Fire Areas did not address the potential for a "soft" ground on the 125 VDC system. Fundamental assumptions in the circuit analysis and fire area assessment are that:

1. A single short to ground will not affect the ability of the credited DC system to accomplish its intended safe shutdown function, and

2. Multiple hot shorts or shorts to ground will result in sufficient fault current as to cause actuation of the protective devices.

A postulated fire within the Power Boards will potentially cause a single ground in the alternate 125 VDC supply. However, this single ground will not affect the safe shutdown function(s) of the credited 125 VDC bus. This is consistent with the conclusions of the NRC Special Inspection Report for the Fort Calhoun event, which states on page 26:

> "The team concluded that dc control power remained available to the safety-related 4160 VAC buses throughout the event, and the grounds on the dc buses would not have prevented the dc system from performing its safety function. Because the system was normally ungrounded, a single ground on either the positive or negative bus of the system did not result in the loss of a circuit, but did indicate a degraded condition."

Thus, the postulated "soft" ground on the credited 125 VDC electrical distribution system does not affect the assumptions in the NMP1 NSCA performed to support NFPA 805 transition with respect to separation requirements for redundant trains of the 125 VDC system. The analysis demonstrates that sufficient separation exists to ensure one train of the 125 VDC system remains free of fire damage. A postulated fire at each of the power board locations does not affect the capability to maintain battery charging to the unaffected train of 125 VDC and, as such, a minimal leakage current (i.e.; below the fuse opening) due to a "soft" ground would not affect battery capacity or charging capability.

Electrical Separation and Independence

The safety related electrical distribution system at NMP1 is designed to provide two redundant and independent trains of control and power to safety related loads during and following anticipated transients and design basis accidents. The design basis requirement also includes a criterion for limiting fire damage to one train of the electrical distribution system.

To prevent paralleling the two trains of the safety related 125 VDC electrical distribution system, thereby losing train independence and redundancy, the following interlocks are provided:

- The 125 VDC circuit breakers feeding computer MG Set 167 from DC battery boards 11 and 12 are key interlocked to prevent closing both breakers at the same time.

- The 125 VDC circuit breakers feeding DC valve boards 11 and 12 from 125 VDC battery boards 11 and 12 are mechanically interlocked to prevent closing both breakers at the same time.

The 125 VDC system design and configuration meets the electrical separation requirements and single failure criterion and remains in compliance with the existing plant licensing basis based on the following:

- The system is equipped with a ground detection circuit,

- Each control power feed is equipped with isolation devices which will effectively isolate the affected battery board from an overcurrent condition or hot short, and

- The dual feeds from the redundant 125 VDC power boards to each compartment are selected via a mechanically operated knife switch located in each power board to ensure electrical separation is maintained.

Conclusion

The event at Fort Calhoun is considered Operating Experience (OE). Although the existing NRC guidance (RG 1.189, NUREG-6850) and industry guidance (NEI 001-01) do not require evaluation of a "soft" ground as part of the circuit analysis and fire area assessments performed for NFPA 805 transition, the Fort Calhoun fire scenario has been evaluated for applicability to NMP1. This evaluation has concluded that the occurrence of a fire caused by a lack of proper breaker preventive maintenance and the resulting consequences is not a likely fire scenario at NMP1. This is mainly due to differences in design configuration and maintenance activities at NMP1. In addition, the fuses associated with each DC feed to the loads are sized to ensure that any short to ground faults are effectively isolated from the affected battery board.

However, as documented in Information Notice 94-80, multiple grounds could lead to unpredictable spurious operation of equipment, inoperable equipment, and unanalyzed battery loads or equipment failure modes. To enhance operator knowledge and plant response to the potential for "soft" grounds, a change to post-fire safe shutdown procedure N1-SOP-21.1 ("Fire In Plant") is being processed. This change will alert the operators to the potential for a fire induced ground in the DC system following a confirmed fire in the plant, thereby enhancing reliability and defense-in-depth with respect to maintaining the availability of 125 VDC control power. No plant modifications or other procedure changes are deemed necessary to address this issue.

ENCLOSURE 2

NINE MILE POINT UNIT 1

UPDATED RESPONSES TO

PROBABILISTIC RISK ASSESSMENT RAI 05 AND RAI 08

ENCLOSURE 2

NINE MILE POINT UNIT 1
UPDATED RESPONSES TO PROBABILISTIC RISK ASSESSMENT RAI 05 AND RAI 08

By letter dated February 27, 2013, Nine Mile Point Nuclear Station, LLC (NMPNS) provided responses to requests for additional information documented in the NRC's letter dated January 3, 2013. In the February 27, 2013 letter, NMPNS committed to provide updates to the responses for Probabilistic Risk Assessment RAI 05 and Probabilistic Risk Assessment RAI 08 (if needed) to reflect the response to Safe Shutdown / Circuit Analysis RAI 01, in which the definition of the Nine Mile Point Unit 1 (NMP1) safe and stable condition has been revised. Each NRC RAI is repeated (in italics), followed by the updated NMPNS response. Changes to the responses are identified by revisions bars drawn in the right margin.

Probabilistic Risk Assessment RAI 05

Section 10 of NUREG/CR-6850, Supplement 1, states that a sensitivity analysis should be performed when using the fire ignition frequencies in the supplement instead of the fire ignition frequencies provided in Table 6-1 of NUREG/CR-6850. Provide the sensitivity analysis of the impact on using the supplement 1 frequencies instead of the Table 6-1 frequencies on core damage frequency (CDF), large early release frequency (LERF), delta (Δ)CDF, and ΔLERF for all of those bins that are characterized by an alpha that is less than or equal to one. If the sensitivity analysis indicates that the change in risk acceptance guidelines would be exceeded using the values in Table 6-1, justify not meeting the guidelines.

Updated Response to Probabilistic Risk Assessment RAI 05

The NMP1 Fire PRA uses the ignition frequencies from the latest guidance related to fire PRAs as given in Supplement 1 to NUREG/CR-6850. Supplement 1 to NUREG/CR-6850 (Section 10.2) addresses the use of the ignition frequencies therein as follows:

> "The NRC accepts use of these revised fire bin ignition frequencies for fire PRAs conducted for NFPA-805 transition for best-/point-estimate calculations of fire risk (core damage frequency [CDF] and large early release frequency [LERF]), including delta-risk values from plant change evaluations, with the following provision. The fire PRA, including plant change evaluations, must also evaluate the sensitivity of the risk and delta-risk results to evaluations performed using the current fire bin ignition frequencies in EPRI 1011989, NUREG/CR-6850, Chapter 6, "Fire Ignition Frequencies," Table 6-1, "Fire Frequency Bins and Generic Frequencies," and Appendix C, "Determination of Generic Fire Frequencies," Table C-3, "Generic Fire Ignition Frequency Model for U.S. Nuclear Power Plants." For those cases where the results from this sensitivity analysis indicate a change in the potential risk significance associated with elements of the fire PRA or plant change evaluations that affects the decisions being made (e.g., what is acceptable with the new frequencies from EPRI 1016735 might not be acceptable with the current applicable set from EPRI 1011989, NUREG/CR-6850), the licensee must address this situation by considering fire protection, or related, measures that can be taken to provide additional defense in-depth."

With respect to the required sensitivity analysis, a footnote provides the following clarification:

> "The sensitivity analyses should be performed for a fire ignition frequency bin using the mean of the fire ignition frequency bins contained in NUREG/CR-6850. Furthermore, sensitivity analyses only need to be performed for those bins characterized by an alpha from the EPRI 1016735 analysis that is less than or equal to 1. Note that an alpha value less than or equal to 1 is characteristic of a reverse-J shaped probability density function, i.e., the same shape as the non-informative prior distributions used in EPRI 1016735. This reverse-J shape is indicative of the large uncertainty in the bin fire

frequency due to the sparsity of data for that bin, and therefore, the potential for significant changes should the post-2000 fire event data differ significantly from the 1991-2000 data. The required sensitivity analysis is, for the purpose of this interim solution, judged to provide an adequate indication of the effects on risk and delta-risk in such a case."

Results of the Sensitivity Analysis

Table PRA RAI 05-1 lists the ignition frequencies with alpha values ≤ 1. Table PRA RAI 05-2 lists the risk results when the ignition frequencies from NUREG/CR-6850 are used, as well as the risk results as reported in the updated LAR Transition Report, which are based on Supplement 1 to NUREG/CR-6850 ignition frequencies. Table PRA RAI 05-3 lists, at the fire area level, the risk results using ignition frequencies from NUREG/CR-6850 with alpha values ≤ 1.

An evaluation of the sensitivity results against Regulatory Guide 1.174 indicates that the delta risks by fire area in Table PRA RAI 05-3 using the NUREG/CR-6850 ignition frequencies meet the risk acceptance guidelines illustrated for Regions II and III of Figures 4 and 5 in Regulatory Guide 1.174 on an individual fire area basis. However, the total increase in risk associated with the implementation of NFPA 805 for the overall plant calculated by summing the risk increases exceeds the acceptance guidelines, as summarized in Table PRA RAI 05-2.

Excluding fire risk, the plant risks associated with internal events, seismic, and high winds are estimated from Table 1 in the Fire Risk Evaluations (FRE) Report (N1-FRE-F001, Revision 0) and are also shown in Table PRA RAI 05-2 below. Summing those risks with the fire risks gives the total plant CDF and LERF including fire and other risks (Table PRA RAI 05-2). Total CDF and LERF including non-fire risks remain below the critical levels of 10^{-4} for CDF and 10^{-5} for LERF. However, the ΔCDF and ΔLERF results exceed the delta risk guidelines (10^{-5} for CDF and 10^{-6} for LERF).

Table PRA RAI 05-3 below lists the contribution to delta CDF and delta LERF for each fire area when the Fire PRA model is quantified using the frequencies from NUREG/CR-6850. The results indicate that most of the contribution to delta CDF is generated by Fire Area 05 (~81%) and Fire Area 11 (~11%). These two areas are the top contributors to LERF as well. Consistent with the guidance in Section 10.2 of Supplement 1 to NUREG/CR-6850, fire protection, or related, measures that can be taken to provide defense in-depth for these three areas are discussed in the following paragraphs.

Justification for Not Meeting the Guidelines with the Higher Ignition Frequencies

As suggested in Section 10.2 of Supplement 1 to NUREG/CR-6850, NMPNS has identified fire protection and related measures that provide additional defense-in-depth (DID), as justification for the sensitivity analysis results not meeting the delta risk guidelines. These measures are presented in the Fire Risk Evaluation Report (N1-FRE-F001) and are summarized below for the fire areas that contribute the most to the calculated delta risk.

Defense in Depth Measures for Fire Area 05

Fire Area 05 is relatively large covering most of the turbine building above elevation 261'. This fire area can be classified in two groups of fire zones. The first group gathers those fire zones where there is no installed automatic fire suppression system, or there is such a system but no credit is taken for it

in the Fire PRA. This group consists of Fire Zones FBZT261S, OG1, OG2, OG3, T1A, T4B, T4D, T5A, T6A, T6B, T6C, T6D, T7A, T8A, and T8B.

- There is no credit in the Fire PRA for the installed fire detection systems, automatic fire suppression systems, and manual suppression in Fire Zones FBZT261S, T5A, T6C, T6D and T8A. The following systems are available in these zones and are credited for DID:

Zone	Detection Systems for DID	Suppression Systems for DID
FBZT261S	DA-2161E, DA-2161M	WP-2161
T5A	D-2294, D-2304	SP-2314, SP-2324
T6C	D-2385, D-2395, D-2395FL, D-2395PL	WD-2395FL
T6D	DA-2375	WP-2375
T8A	D-2445, D-2485	SP-2465

- In Fire Zone T1A, there are no installed fire detection systems or automatic fire suppression systems, and no credit is taken in the Fire PRA for manual suppression. Manual fire suppression by the fire brigade is credited for DID.

- In Fire Zones OG1, OG2, T4D, T6B, T7A and T8B, no credit is taken for the installed fire detection system and subsequent manual suppression (no automatic suppression system is installed in these fire zones). The following systems are available and are credited for DID:

Zone	Detection Systems for DID
OG1	D-7013
OG2	D-7013
T4D	D-2194
T6B	D-2355, D-2405
T7A	DA-2425
T8B	D-2485

- In Fire Zones OG3, T4B, and T6A, no credit is taken for the installed automatic fire suppression system, but the Fire PRA credits the installed fire detection systems and subsequent manual suppression (manual suppression in T6A is credited only for the structural steel fire scenario). The following systems are available and are credited for DID:

Zone	Suppression System(s) for DID
OG3	SP-7053
T4B	SP-2224, WP-2092
T6A	SP-2314, C-2365

The second group of fire zones is made up of the balance of fire zones in the fire area; i.e.: T1, T3A, T3B, T4A, T4C, and FBZT261N. For these fire zones, the Fire PRA takes credit for installed fire detection systems and automatic suppression systems, as well as manual suppression. The local CO_2 fire suppression system is credited in T1, but with manual actuation only.

Defense in Depth Measures for Fire Area 11

Fire Area 11 is equipped with a manual CO_2 system (C-3031) credited for DID in Fire Zone C2. Fire Zone C2 is the Auxiliary Control Room (or Relay Room) located under the main control room. This system is not credited in the Fire PRA.

Defense in Depth Measures Applicable for All Fire Areas

The governing procedures for fire protection activities are GAP-INV-02, "Control of Material Storage Areas," and GAP-FPP-02, "Control of Hot Work." These procedures are not credited explicitly in the Fire PRA (i.e., the Fire PRA does not include failure probabilities to follow the requirements of these procedures) for postulating transient fires within Fire Area 05. The procedures are considered in the Fire PRA consistent with the guidelines in NUREG/CR-6850 for selecting the appropriate credit for prompt suppression and hotwork manual suppression curve for the appropriate scenarios and for determining the influence factors serving as weighting factors for transient fire ignition frequencies. Consequently, the specific provisions of these procedures are credited for DID for: (1) controlling transient combustibles throughout the plant; and (2) assigning compensatory measures to maintenance activities that may temporarily change the plant configuration.

Effect of Response to Safe Shutdown / Circuit Analysis RAI 01

LAR Section 4.2.1.2 originally defined the NMP1 safe and stable condition as "the ability to maintain $K_{eff} < 0.99$ with a reactor coolant temperature at or below the requirements for hot shutdown and then subsequently cool down and maintain NMP1 in a cold shutdown condition." In the response to Safe Shutdown / Circuit Analysis RAI 01, the definition of the NMP1 safe and stable condition for the "At-Power" analysis has been revised to hot shutdown. Analyses performed to support the response to Safe Shutdown / Circuit Analysis RAI 01 indicate an improvement to the delta risk numbers. In particular, the plant-level ΔCDF decreased from 1.52E-05/yr to 1.11E-05/yr, and the ΔLERF decreased from 1.71E-06/yr to 1.29E-06/yr.

Table PRA RAI 05-1: Ignition Frequencies with Alpha Less than or Equal to 1

Supp. 1 Bin	Ignition Source (Location)	Supp. 1 Alpha	Supp. 1 Mean Frequency (1 / y)	NUREG/CR -6850 Mean Frequency (1 / y)	Frequency Ratio: NUREG/CR -6850 to Supp. 1
1	Batteries (Battery Room)	0.5	3.26E-04	7.5E-04	2.3
4	Main control board (Control Room)	1	8.24E-04	2.5E-03	3.0
9	Air Compressors (Plant-Wide)	0.5	4.65E-03	2.4E-03	0.5
11	Cable fires caused by welding and cutting (Plant-Wide)	1	9.43E-04	2.0E-03	2.1
13	Dryers (Plant-Wide)	0.5	4.20E-04	2.6E-03	6.2
15.1	Electrical Cabinets Non-HEAF (Plant-Wide)	0.453	2.36E-02	4.5E-02	1.9
22	RPS MG sets (Plant-Wide)	0.92	9.33E-04	1.6E-03	1.7
31	Cable fires caused by welding and cutting (Turbine Building)	0.5	4.50E-04	1.6E-03	3.6

Table PRA RAI 05-2: Sensitivity Study Results

Risk Measure (/yr)	Result with Supplement 1 Ignition Frequencies (Ref. Updated LAR Table W-3, N1-FRE-F001, Revision 1)	Sensitivity Result with NUREG/CR-6850 Ignition Frequencies
CDF (fire)	2.06E-05	3.29E-05
CDF (other)	5.26E-06	5.26E-06
CDF (total)	2.59E-05	3.82E-05
LERF (fire)	2.23E-06	4.60E-06
LERF (other)	2.07E-06	2.07E-06
LERF (total)	4.30E-06	6.66E-06
ΔCDF	8.47E-06	1.11E-05
ΔLERF	7.05E-07	1.29E-06

Table PRA RAI 05-3: Delta Risks by Fire Area

Fire Area	ΔCDF (/yr)	ΔCDF Contribution	ΔLERF (/yr)	ΔLERF Contribution
01	2.62E-07	2.37%	5.32E-08	4.12%
02	1.08E-07	0.97%	3.20E-08	2.48%
04	0.00E+00	0.00%	1.60E-15	0.00%
05	8.92E-06	80.69%	4.11E-07	31.83%
06	1.26E-07	1.14%	1.27E-08	0.98%
07	2.26E-07	2.04%	1.11E-08	0.86%
09	2.32E-08	0.21%	1.48E-09	0.11%
10	3.25E-08	0.29%	4.01E-09	0.31%
11	1.26E-06	11.43%	7.01E-07	54.29%
12	3.17E-11	0.00%	1.63E-09	0.13%
13	4.34E-09	0.04%	3.87E-09	0.30%
14	0.00E+00	0.00%	0.00E+00	0.00%
15	1.29E-09	0.01%	6.00E-12	0.00%
16A	0.00E+00	0.00%	0.00E+00	0.00%
16B	0.00E+00	0.00%	0.00E+00	0.00%
17A	0.00E+00	0.00%	0.00E+00	0.00%
17B	0.00E+00	0.00%	0.00E+00	0.00%
18	6.08E-10	0.01%	4.04E-10	0.03%
19	8.84E-12	0.00%	1.49E-11	0.00%
20	5.54E-11	0.00%	1.03E-11	0.00%
21	5.82E-11	0.00%	1.04E-11	0.00%
22	8.13E-08	0.74%	5.43E-08	4.21%
23	6.50E-09	0.06%	4.34E-09	0.34%
24	6.95E-10	0.01%	2.79E-11	0.00%
EXT	N/A	N/A	N/A	N/A
Sum	1.11E-05	**100.00%**	1.29E-06	**100.00%**

Probabilistic Risk Assessment RAI 08

The transition report describes and justifies an initial coping time of 72 hours, after which, actions are necessary to maintain safe and stable beyond 72 hours. Provide a discussion of the actions necessary during and beyond 72 hours to maintain safe and stable conditions beyond 72 hours such as refilling fluid tanks or re-aligning systems. Evaluate quantitatively or qualitatively the risk associated with these actions and equipment necessary to maintain safe and stable beyond 72 hours given the post-fire scenarios during which they may be required.

Updated Response to Probabilistic Risk Assessment RAI 08

The PRA model uses a 24 hour mission time for success criteria, similar to other PRAs and consistent with ASME/ANS RA-Sa-2009. The plant must be in a safe stable state (e.g., hot shutdown condition) during this timeframe. Decay heat levels are lower after 24 hours of success (safe stable state with inventory control and heat removal) in the PRA model and offsite resources and recoveries are available in case of any failures after 24 hours. The probability of failures that may occur after 24 hours and beyond 72 hours is considered negligible when other capabilities to recover are included. Those support system dependencies in the PRA that are potentially sensitive to time have been evaluated. The following summarizes these considerations:

- Condensate Storage Tank: This tank supports reactor pressure vessel (RPV) makeup from the feedwater (high pressure coolant injection - HPCI) system and control rod drive (CRD) pumps, and is a source of emergency condenser makeup. Considering RPV makeup without the emergency condensers, this tank is judged inadequate to last 72 hours. With the emergency condensers and no loss of coolant accident (LOCA) condition, the tank may be adequate for 72 hours. There are 40,000 gallons of makeup water available to the condensate storage tanks via gravity feed from the condensate demineralizer water storage tank. Additional makeup would be required for a 72 hour mission time. Fire water make up to the emergency condenser makeup tanks is available. Damage repair procedure N1-DRP-OPS-001 has instructions for supplying the demineralized water storage tank from city water, service water, or fire water. The demineralized water storage tank can then be drained to the condensate storage tanks by opening manual valve 57-31 located at Turbine Building elevation 305', column line J-1. The Fire PRA was also updated to model the recovery actions aimed at ensuring long-term EC makeup tank water supply via the diesel-driven fire pump and quantitatively evaluate their risk.

- 125V DC Power: Since emergency AC power is required, the batteries need only be available on demand to support emergency diesel generator (EDG) starting and other initial start loads. As long as the static charger and AC power are available after this battery demand, the batteries are not required in the long term. The batteries cannot supply DC loads for 24 hours without AC power support.

- EDG Fuel Supply: At full load, one EDG consumes 228 gallons of fuel oil per hour. Each EDG has a 12,000 gallon fuel oil storage tank and a 400 gallon day tank. This would allow operation for more than 48 hours. The fuel oil storage tanks can be cross connected to allow operation of one EDG at full load for 4 days. Therefore, the EDG fuel oil supply will last for 72 hours.

- Room Cooling: The only areas of concern in the PRA are the two EDG areas (roof fans and the roll door in each EDG room). All other areas were judged to have slow heat up rates and/or maximum temperatures were sufficiently low.

The risks associated with activities occurring after 24 hours have been evaluated qualitatively and are considered to be negligible and, thus, acceptable.

LAR Section 4.2.1.2 originally defined the NMP1 safe and stable condition as "the ability to maintain K_{eff} < 0.99 with a reactor coolant temperature at or below the requirements for hot shutdown and then subsequently cool down and maintain NMP1 in a cold shutdown condition." In response to Safe Shutdown / Circuit Analysis RAI 01, the definition of the NMP1 safe and stable condition for the "At Power" analysis has been revised to hot shutdown. This change led to the elimination of several VFDRs which pertained to cold shutdown, and also led to the creation of new VFDRs associated with long-term water supply to the EC makeup tanks. These new VFDRs were addressed by taking credit for recovery actions whose feasibility was evaluated and the risk quantitatively evaluated in the Fire PRA.

ENCLOSURE 3

REVISIONS TO THE LAR TRANSITION REPORT

WITH CHANGES HIGHLIGHTED

The following are revisions to the Transition Report (included with the License Amendment Request (LAR) submitted by Nine Mile Point Nuclear Station, LLC (NMPNS) letter dated June 11, 2012) resulting from the responses to NRC requests for additional information (RAI) Safe Shutdown / Circuit Analysis RAI 01 and Safe Shutdown / Circuit Analysis RAI 03. The revised Transition Report pages, with the changes highlighted to facilitate their identification, are as noted below.

- Sections 4.2 and 4.3 (Pages 14 through 29a)
- Table 4-3 (Pages 54 through 60)
- Attachment A (Pages A-42 through A-44)
- Attachment B (Pages B-1 through B-102)
- Attachment F (Pages F-6 and F-7)
- Attachment G (Pages G-1 through G-41)

REVISIONS TO TRANSITION REPORT

SECTION 4.2, NUCLEAR SAFETY PERFORMANCE CRITERIA

SECTION 4.3, NON-POWER OPERATIONAL MODES

Pages 14 through 29a with changes highlighted.

structures housing equipment required for nuclear plant operations are considered as "power block" structures.

These structures are listed in Attachment I and define the "power block" and "plant".

4.2 Nuclear Safety Performance Criteria

The Nuclear Safety Performance Criteria are established in Section 1.5 of NFPA 805. Chapter 4 of NFPA 805 provides the methodology to determine the fire protection systems and features required to achieve the performance criteria outlined in Section 1.5. Section 4.3.2 of NEI 04-02 provides a systematic process for determining the extent to which the pre-transition licensing basis meets these criteria and for identifying any necessary fire protection program changes. NEI 04-02, Appendix B-2 provides guidance on documenting the transition of Nuclear Safety Capability Assessment Methodology and the Fire Area compliance strategies.

4.2.1 Nuclear Safety Capability Assessment Methodology

The Nuclear Safety Capability Assessment (NSCA) Methodology review consists of four processes:

- Establishing compliance with NFPA 805 Section 2.4.2
- Establishing the Safe and Stable Conditions for the Plant
- Establishing Recovery Actions
- Evaluating Multiple Spurious Operations

The methodology for demonstrating reasonable assurance that a fire during non-power operational (NPO) modes will not prevent the plant from achieving and maintaining the fuel in a safe and stable condition is an additional requirement of 10 CFR 50.48(c) and is addressed in Section 4.3.

4.2.1.1 Compliance with NFPA 805 Section 2.4.2

Overview of Process

NFPA 805 Section 2.4.2 Nuclear Safety Capability Assessment states:

"The purpose of this section is to define the methodology for performing a nuclear safety capability assessment. The following steps shall be performed:

(1) Selection of systems and equipment and their interrelationships necessary to achieve the nuclear safety performance criteria in Chapter 1

(2) Selection of cables necessary to achieve the nuclear safety performance criteria in Chapter 1

(3) Identification of the location of nuclear safety equipment and cables

(4) Assessment of the ability to achieve the nuclear safety performance criteria given a fire in each fire area"

The NSCA methodology review evaluated the existing post-fire safe shutdown analysis (SSA) methodology against the guidance provided in NEI 00-01, Revision 2, Chapter 3, "Deterministic Methodology," as discussed in Appendix B-2 of NEI 04-02. NMP1 used the guidance provided in NEI 00-01, Revision 2 because it is endorsed as an

acceptable methodology in NRC RG 1.205 and due to feedback received as a result of NRC requests for additional information on other post-pilot plant LARs.

The methodology is depicted in Figure 4-2 and consisted of the following activities:

- Each specific subsection of NFPA 805 Section 2.4.2 was correlated to the corresponding section of Chapter 3 of NEI 00-01, Revision 2. Based upon the content of the NEI 00-01 methodology statements, a determination was made of the applicability of the section to the station.
- The plant-specific methodology was compared to applicable sections of NEI 00-01 and one of the following alignment statements and its associated basis were assigned to the section:
  - Aligns
  - Aligns with Intent
  - Not in Alignment
  - Not in Alignment, but Prior NRC Approval
  - Not in Alignment, but no adverse consequences
- For those sections that do not align, an assessment was made to determine if the failure to maintain strict alignment with the guidance in NEI 00-01 could have adverse consequences. Since NEI 00-01 is a guidance document, portions of its text could be interpreted as 'good practice' or intended as an example of an efficient means of performing the analyses. If the section has no adverse consequences, these sections of NEI 00-01 can be dispositioned without further review.

In addition, a review of NEI 00-01, Revision 3 was conducted against the guidance from NEI 00-01, Revision 2. There were no gaps relative to MSOs identified.
The comparison of the NMP1 existing post-fire SSA to NEI 00-01 Chapter 3 (NEI 04-02 Table B-2) was performed and documented in EIR 51-9133191, Nine Mile Point Unit 1 – Nuclear Safety Capability Assessment.

Results from Evaluation Process

The method used to perform the NSCA with respect to selection of systems and equipment, selection of cables, and identification of the location of equipment and cables, either meets the NRC endorsed guidance from NEI 00-01, Revision 2, Chapter 3 (as supplemented by the gap analysis to Revision 3) directly or meets the intent of the endorsed guidance with adequate justification as documented in Attachment B. Referenced documents are planned as being retained as post-transition documents.

NEI 00-01, Revision 2, Chapter 3 contains guidance criteria concerning identifying required and important to SSD components. These specific guidance criteria are not applicable to plants transitioning to NFPA 805; therefore, they were not addressed for NMP1.

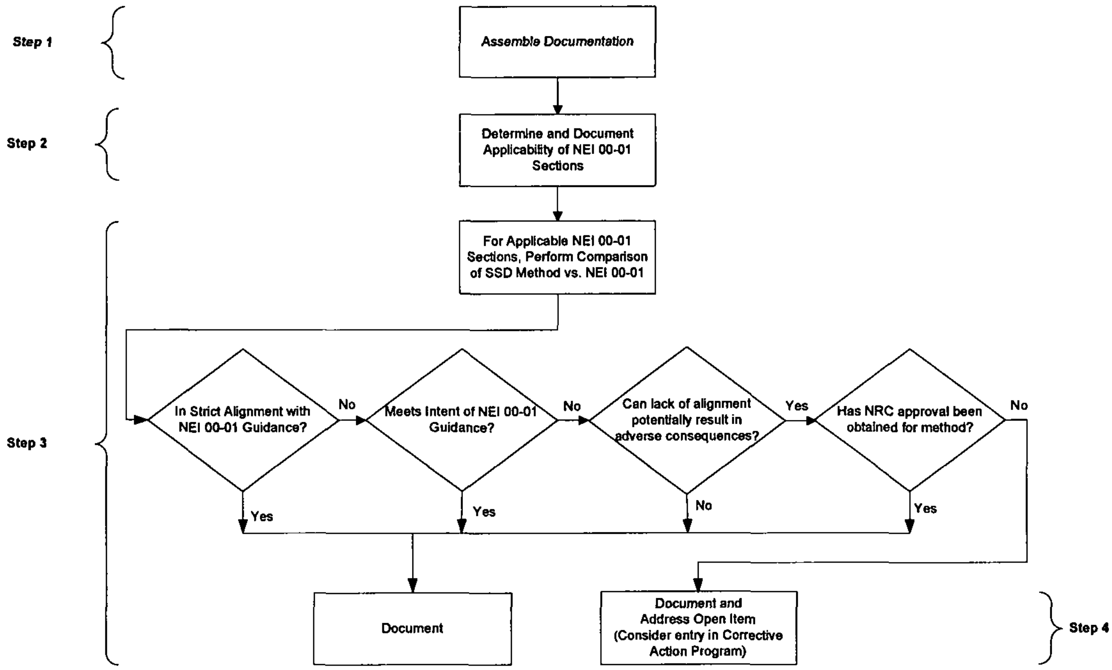

Figure 4-2 – Summary of Nuclear Safety Methodology Review Process (FAQ 07-0039)

4.2.1.2 Safe and Stable Conditions for the Plant

Overview of Process

The nuclear safety goals, objectives and performance criteria of NFPA 805 allow more flexibility than the previous deterministic programs based on 10 CFR 50 Appendix R and NUREG-0800, Section 9.5.1 (and NEI 00-01, Chapter 3), since NFPA 805 only requires the licensee to maintain the fuel in a safe and stable condition rather than achieve and maintain cold shutdown.

NFPA 805, Section 1.6.56, defines Safe and Stable Conditions as follows

> *"For fuel in the reactor vessel, head on and tensioned, safe and stable conditions are defined as the ability to maintain K_{eff} <0.99, with a reactor coolant temperature at or below the requirements for hot shutdown for a boiling water reactor and hot standby for a pressurized water reactor. For all other configurations, safe and stable conditions are defined as maintaining K_{eff} <0.99 and fuel coolant temperature below boiling."*

The nuclear safety goal of NFPA 805 requires "*...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*" without a specific reference to a mission time or event coping duration.

For the plant to be in a safe and stable condition, it may not be necessary to perform a transition to cold shutdown as currently required under 10 CFR 50, Appendix R. Therefore, the unit may remain at or below the temperature defined by a hot standby/hot shutdown plant operating state for the event.

Results

Demonstration of the Nuclear Safety Performance Criteria for safe and stable conditions was performed in two analyses.

- At-Power analysis for potential fires while in the~~,~~ Power Operating Condition~~s~~ (Reactor mode switch is in "Startup" or "Run" position and the reactor is critical or criticality is possible due to control rod withdrawal) or Shutdown Condition – Hot (Reactor mode switch is in "Shutdown" position and reactor coolant temperature is greater than 212°F), but not on shutdown cooling mode of decay heat removal.~~including startup and run.~~ This analysis is discussed in Section 4.2.4.
- Non-Power analysis for potential fires while in Shutdown Condition – Hot and lower operating conditions.~~, which includes Hot Shutdown and below.~~ This analysis is discussed in Section 4.3.

Based on the EIR 51-9133191, Nine Mile Point Unit 1 – Nuclear Safety Capability Assessment, the NFPA 805 licensing basis for a safe and stable condition is defined as the ability to maintain $K_{eff} < 0.99$ with a reactor coolant temperature at or below the requirements for hot shutdown.~~and then subsequently cool down and maintain NMP1 in a cold shutdown condition.~~

The At-Power analysis includes a primary and alternate means of achieving and maintaining safe and stable conditions. The primary means of achieving and maintaining Hot Shutdown (HSD) is via the Emergency Cooling system. Either of the two redundant Emergency Cooling decay heat removal loops can achieve and maintain HSD. The Emergency Cooling system operates by natural circulation where steam flows upward to the condenser(s) and returns as condensate to the Reactor Pressure Vessel (RPV). Decay heat is removed through the transfer of heat from the reactor coolant to the shell side water of the Emergency Condenser(s),~~Cooling~~ which vents the developed steam to atmosphere. Operation of either Emergency Cooling loop can sustain HSD conditions for 8 hours without the need for makeup. ~~from the Condensate Storage Tank (CST).~~ Upon achieving HSD conditions, the plant is able to maintain safe and stable operation for an extended period of time using the Emergency Cooling system. After 8 hours, the Emergency Condenser makeup tanks can be replenished as needed using the diesel driven fire pump (DFP), which draws water from Lake Ontario (effectively an infinite source). Periodic refueling of the DFP is accomplished in accordance with existing plant procedures using an on-site fuel source. Reactor coolant makeup is required after 8 hours, assuming a nominal Technical Specification leakage rate of 25 gpm. Makeup is provided via the Control Rod Drive (CRD) system using one of the CRD pumps drawing suction from the CST. AC power is required to operate a CRD pump. The diesel driven fire pump may be aligned to provide primary makeup in the event no CRD pump is available.

The Emergency Cooling system can be initiated either manually or automatically. The RPS instruments and logic that automatically initiate the Emergency Cooling system on high reactor pressure or low-low reactor level have been included in the analysis. Manual initiation of the Emergency Cooling system can be accomplished from either the Control Room or Remote Shutdown Panel (RSP) if Control Room abandonment is

necessary, depending on the fire location. AC power is not required to manually initiate Decay Heat Removal (DHR) via the Emergency Cooling system.

In the event the primary means of decay heat removal during HSD ~~method~~ is not available (i.e., Emergency Cooling system not available), the plant can be maintained in HSD by opening three Electromagnetic Relief Valves (ERVs) in the automatic depressurization system (ADS) and blowing steam to the Torus to reduce pressure. When reactor pressure reaches approximately 365 psig, Core Spray (CS) may be utilized to provide core cooling. AC and DC electrical power are required for this method of decay heat removal.

The ADS system can be initiated either manually or automatically. The RPS instruments and logic automatically initiate the ADS system on a combination of low-low-low reactor level and high drywell pressure.

The CS system can be initiated either manually or automatically. The RPS instruments and logic automatically initiate the CS system on low-low reactor level or high drywell pressure.

The instrumentation and logic circuitry that automatically initiates ADS and CS have been included in the analysis. Manual initiation of the ERVs and CS system is accomplished from the Control Room. In the event spurious actuations of the ERVs

take place due to a Control Room fire, CS can be initiated manually from outside the Control Room if Control Room abandonment is necessary.

~~The preferred method of achieving and maintaining Cold Shutdown (CSD) is via the Shutdown Cooling System (SDC). When reactor pressure is reduced to 120 psig and reactor temperature is reduced to 350°F, the plant can be transitioned to CSD by initiating SDC. The SDC system is supported by Reactor Building Closed Loop Cooling (RBCLC) and Emergency Service Water (ESW). One SDC pump in association with RBCLC and ESW is required to achieve and maintain CSD conditions. AC power is required to initiate SDC.~~

~~Under this scenario, reactor coolant makeup is required after 8 hours with an assumed Technical Specification leakage of 25 gpm. Makeup is provided via the Control Rod Drive (CRD) system using one of the CRD pumps drawing suction from the CST. AC power is required to operate a CRD pump. The diesel driven fire pump may also be aligned to provide makeup in the event no CRD pump is available.~~

The alternate means of decay heat removal can be used to maintain safe and stable conditions until such time that the Shutdown Cooling (SDC) system is placed in service. ~~In the event the primary CSD method is not available, the plant can be cooled down to CSD using the CS system.~~ CS is a two loop system. Operation of one loop is adequate to ensure core cooling.~~achieve CSD.~~ When utilizing CS, the reactor vessel eventually floods to the point where the ERVs are passing fluid to the Torus rather than steam, in essence placing the RCS in recirculation through the Torus. During this process, decay heat is removed by operation of the Containment Spray (CTS) system in conjunction with the Containment Spray Raw Water (CTSRW) system. ~~This method will bring the plant directly to CSD.~~ Fully flooding the RPV negates the need for another system to provide inventory makeup. AC power is required to initiate this method.

For either the primary or alternate means of achieving and maintaining safe and stable conditions, AC power is available from either the station Emergency Diesel Generators (EDGs) or offsite power. Actions required to achieve and initially maintain hot shutdown conditions can be performed by the minimum shift complement consisting of reactor operators, senior reactor operators, and non-licensed plant operators. The EDGs can be refueled in accordance with existing plant procedures using an on-site fuel source (tanker truck), until such time that offsite power is restored. Additional resources from the emergency response organization will be available to support EDG refueling activities.

~~Long Term Safe and Stable conditions will be maintained using either the preferred or alternate CSD method. With AC power available from either the station Emergency Diesel Generators (EDGs) or offsite power, CSD conditions can be maintained indefinitely.~~

4.2.1.3 Establishing Recovery Actions

Overview of Process

NEI 04-02 and RG 1.205 suggest that a licensee submit a summary of its approach for addressing the transition of OMAs as recovery actions in the LAR (Regulatory Position 2.21 and NEI-04-02, Section 4.6). As a minimum, NEI 04-02 suggests that the

assumptions, criteria, methodology, and overall results be included for the NRC to determine the acceptability of the licensee's methodology.

The discussion below provides the methodology used to transition pre-transition OMAs and to determine the population of post-transition recovery actions. This process is based on FAQ 07-0030 (ML110070485) and consists of the following steps:

- Step 1: Clearly define the primary control station(s) and determine which pre-transition OMAs are taken at primary control station(s) (Activities that occur in the Main Control Room are not considered pre-transition OMAs). Activities that take place at primary control station(s) or in the Main Control Room are not recovery actions, by definition.

- Step 2: Determine the population of recovery actions that are required to resolve variances from deterministic requirements (VFDRs) (to meet the risk acceptance criteria or maintain a sufficient level of defense-in-depth).
- Step 3: Evaluate the additional risk presented by the use of recovery actions required to demonstrate the availability of a success path.
- Step 4: Evaluate the feasibility of the recovery actions.
- Step 5: Evaluate the reliability of the recovery actions.

Results

The review results are documented in EIR 51-9156521, Recovery Action Review for Nine Mile Point Nuclear Power Station Unit 1 Transition to NFPA 805. Refer to Attachment G for the detailed evaluation process and summary of the results from the process.

4.2.1.4 Evaluation of Multiple Spurious Operations

Overview of Process

NEI 04-02 suggests that a licensee submit a summary of its approach for addressing potential fire-induced MSOs for NRC review and approval. As a minimum, NEI 04-02 suggests that the summary contain sufficient information relevant to methods, tools, and acceptance criteria used to enable the NRC to determine the acceptability of the licensee's methodology. The methodology utilized to address MSOs for NMP1 is summarized below.

As part of the NFPA 805 transition project, a review and evaluation of NMP1 susceptibility to fire-induced MSOs was performed. The process was conducted in accordance with NEI 04-02 and RG 1.205, as supplemented by FAQ 07-0038 Revision 3 (ML110140242). The BWR Generic MSO list in NEI 00-01, Revision 2, dated June 5, 2009 (including a gap analysis to the Revision 3 Generic MSO list) was utilized.

The approach outlined in Figure 4-3 (based on Revision 3 from FAQ 07-0038) is one acceptable method to address fire-induced MSOs. This method used insights from the Fire PRA developed in support of transition to NFPA 805 and consists of the following:

- Identifying potential MSOs of concern.
- Conducting an expert panel to assess plant specific vulnerabilities (e.g., per NEI 00-01, Rev. 1 Section F.4.2).
- Updating the Fire PRA model and existing post-fire SSA to include the MSOs of concern.
- Evaluating for NFPA 805 compliance.
- Documenting results.

This process is intended to support the transition to a new licensing basis. Post-transition changes would use the RI-PB change process. The post-transition change process for the assessment of a specific MSO would be a simplified version of this process, and may not need the level of detail shown in the following section (e.g., An expert panel may not be necessary to identify and assess a new potential MSO.

Identification of new potential MSOs may be part of the plant change review process and/or inspection process).

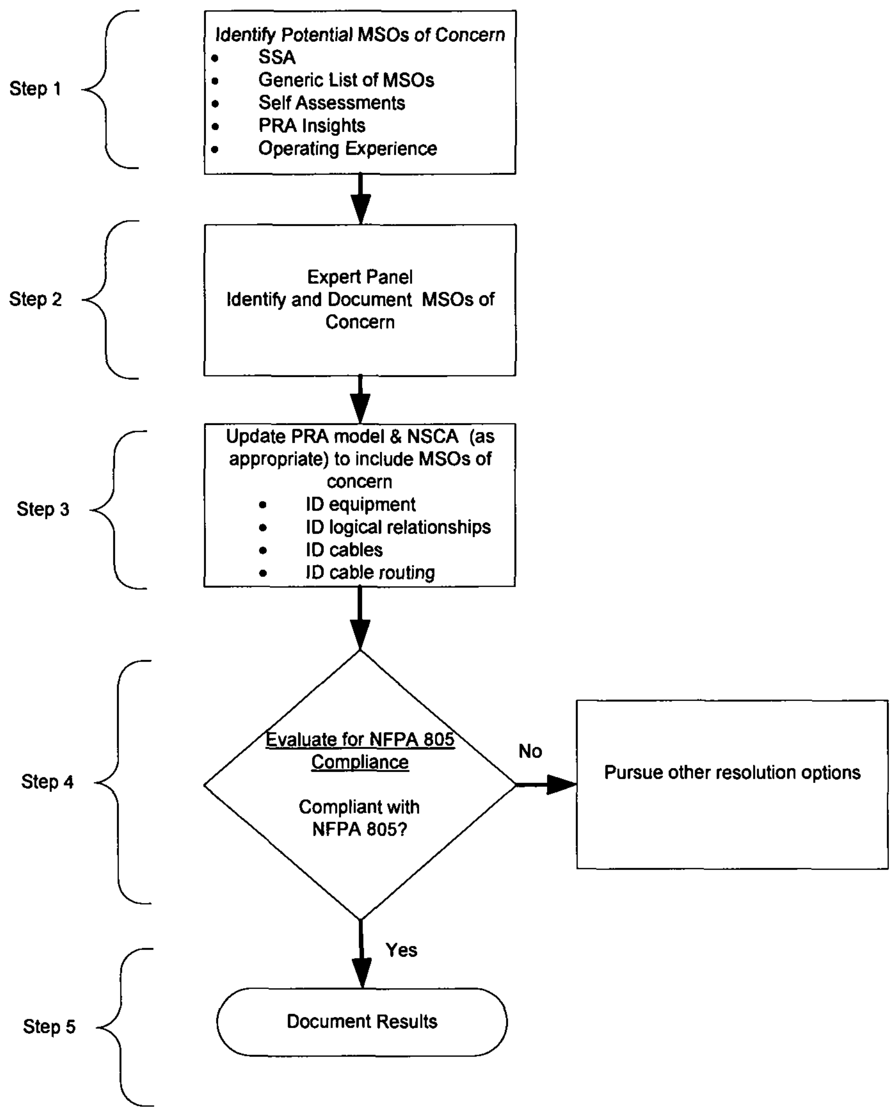

Figure 4-3 – Multiple Spurious Operations – Transition Resolution Process (Based on FAQ 07-0038)

Results

Refer to Attachment F for the process used for NMP1 and the results from the process.

4.2.2 Existing Engineering Equivalency Evaluation Transition

Overview of Evaluation Process

The EEEEs that support compliance with NFPA 805 Chapter 3 or Chapter 4 (both those that existed prior to the transition and those that were created during the transition) were reviewed using the methodology contained in NEI 04-02. The methodology for performing the EEEE review includes the following determinations:

- The EEEE is not based solely on quantitative risk evaluations,

- The EEEE is an appropriate use of an engineering equivalency evaluation,
- The EEEE is of appropriate quality,
- The standard license condition is met,
- The EEEE is technically adequate,
- The EEEE reflects the plant as-built condition, and
- The basis for acceptability of the EEEE remains valid

In accordance with the guidance in RG 1.205, Regulatory Position 2.3.2, and NEI 04-02, as clarified by FAQ 07-0054, Demonstrating Compliance with Chapter 4 of NFPA 805, EEEEs that demonstrate that a fire protection system or feature is 'adequate for the hazard' are summarized in the LAR as follows:

- If not requesting specific approval for 'adequate for the hazard' EEEEs, then the EEEE was referenced where required and a brief description of the evaluated condition was provided.
- If requesting specific NRC approval for 'adequate for the hazard' EEEEs, then the EEEE was referenced where required to demonstrate compliance and was included in Attachment L for NRC review and approval.

In all cases, reliance on EEEEs to demonstrate compliance with NFPA 805 requirements is documented in the LAR.

Results

The review results for EEEEs are documented in EIR 51-9077683, NFPA 805 Fundamental Fire Protection Program and Design Elements Transition Review.

In accordance with the guidance provided in RG 1.205, Regulatory Position 2.3.2, and NEI 04-02, as clarified by FAQ 07-0054, EEEEs used to demonstrate compliance with Chapters 3 and 4 of NFPA 805 are referenced in Attachments A and C as appropriate.

None of the transitioning EEEEs require NRC approval.

4.2.3 Licensing Action Transition

Overview of Evaluation Process

The existing licensing actions (exemptions / safety evaluations) review was performed in accordance with NEI 04-02. The methodology for the licensing action review included the following:

- Determination of the bases for acceptability of the licensing action.
- Determination that these bases for acceptability are still valid and required for NFPA 805.

Results

Attachment K contains the detailed results of the Licensing Action Review.

The following licensing actions will be transitioned into the NFPA 805 fire protection program as previously approved (NFPA 805 Section 2.2.7). These licensing actions are considered compliant under 10 CFR 50.48(c).

- None

The following licensing actions are no longer necessary and will not be transitioned into the NFPA 805 fire protection program:

- An exemption from the requirements of Section III.G.2 of Appendix R for the battery board rooms (FA 16A and FA 16B), since their boundary walls do not provide the required 3-hour rated barriers.
- An exemption from the requirements of Section III.G.2 of Appendix R for the battery rooms (FA 17A and FA 17B), since their boundary walls do not provide the required 3-hour rated barriers.
- An exemption from the requirements of Section III.G of Appendix R for the control room (FA 11), since the control room ceiling does not have a 3-hour rating from the control room side due to unprotected structural steel members.
- An exemption from the requirements of Section III.G.2 of Appendix R for the wall between the reactor building and the turbine building above elevation 340' (FA 1, FA 2, and FA 5), since the wall is not a 3-hour rated barrier.
- An exemption from the requirements of Section III.G.2 of Appendix R for the fire break zone separating FA 1 and FA 2 in the reactor building upper level (elevation 340'), since the wall is not a 3-hour rated barrier.

These exemptions are no longer required because the subject boundaries have been demonstrated adequate for the hazard in an EEEE.

Since the exemptions are either compliant with 10 CFR 50.48(c) or no longer necessary, in accordance with the requirements of 10 CFR 50.48(c)(3)(i), NMPNS requests that the exemptions listed in Attachment K be rescinded as part of the LAR process. See Attachment O, Orders and Exemptions.

4.2.4 Fire Area Transition

Overview of Evaluation Process

The Fire Area Transition (NEI 04-02 Table B-3) was performed using the methodology contained in NEI 04-02 and FAQ 07-0054. The methodology for performing the Fire Area Transition, depicted in Figure 4-4, is outlined as follows:

Step 1 - Assembled documentation. Gathered industry and plant-specific fire area analyses and licensing basis documents.

Step 2 – Documented fulfillment of nuclear safety performance criteria.

- Assessed accomplishment of nuclear safety performance goals. Documented the method of accomplishment, in summary level form, for the fire area.
- Documented evaluation of effects of fire suppression activities. Documented the evaluation of the effects of fire suppression activities on the ability to achieve the nuclear safety performance criteria.
- Performed licensing action reviews. Performed a review of the licensing aspects of the selected fire area and documented the results of the review. See Section 4.2.3.

- Performed existing engineering equivalency evaluation reviews. Performed a review of existing engineering equivalency evaluations (or created new evaluations) documenting the basis for acceptability. See Section 4.2.2.
- Performed a review of pre-transition OMAs to determine those actions taking place outside of the main control room or outside of the primary control station(s). See Section 4.2.1.3.

Step 3 – VFDR identification, characterization and resolution considerations. Identified variances from the deterministic requirements of NFPA 805, Section 4.2.3. Documented variances as either a separation issue or a degraded fire protection system or feature. Developed VFDR problem statements to support resolution.

Step 4 – Performance-Based evaluations (Fire Modeling or Fire Risk Evaluations). See Section 4.5.2 for additional information.

Step 5 – Final Disposition.

- Documented final disposition of the VFDRs in Attachment C (NEI 04-02 Table B-3).
- For recovery action compliance strategies, ensured the manual action feasibility analysis of the required recovery actions was completed. Note: If a recovery action cannot meet the feasibility requirements established per NEI 04-02, then alternate means of compliance were considered.
- Documented the post transition NFPA 805 Chapter 4 compliance basis.

Step 6 – Documented required fire protection systems and features. Reviewed the NFPA 805 Section 4.2.3 compliance strategies (including fire area licensing actions and engineering evaluations) and the NFPA 805 Section 4.2.4 compliance strategies (including simplifying deterministic assumptions) to determine the scope of fire protection systems and features 'required' by NFPA 805 Chapter 4. The 'required' fire protection systems and features are subject to the applicable requirements of NFPA 805 Chapter 3.

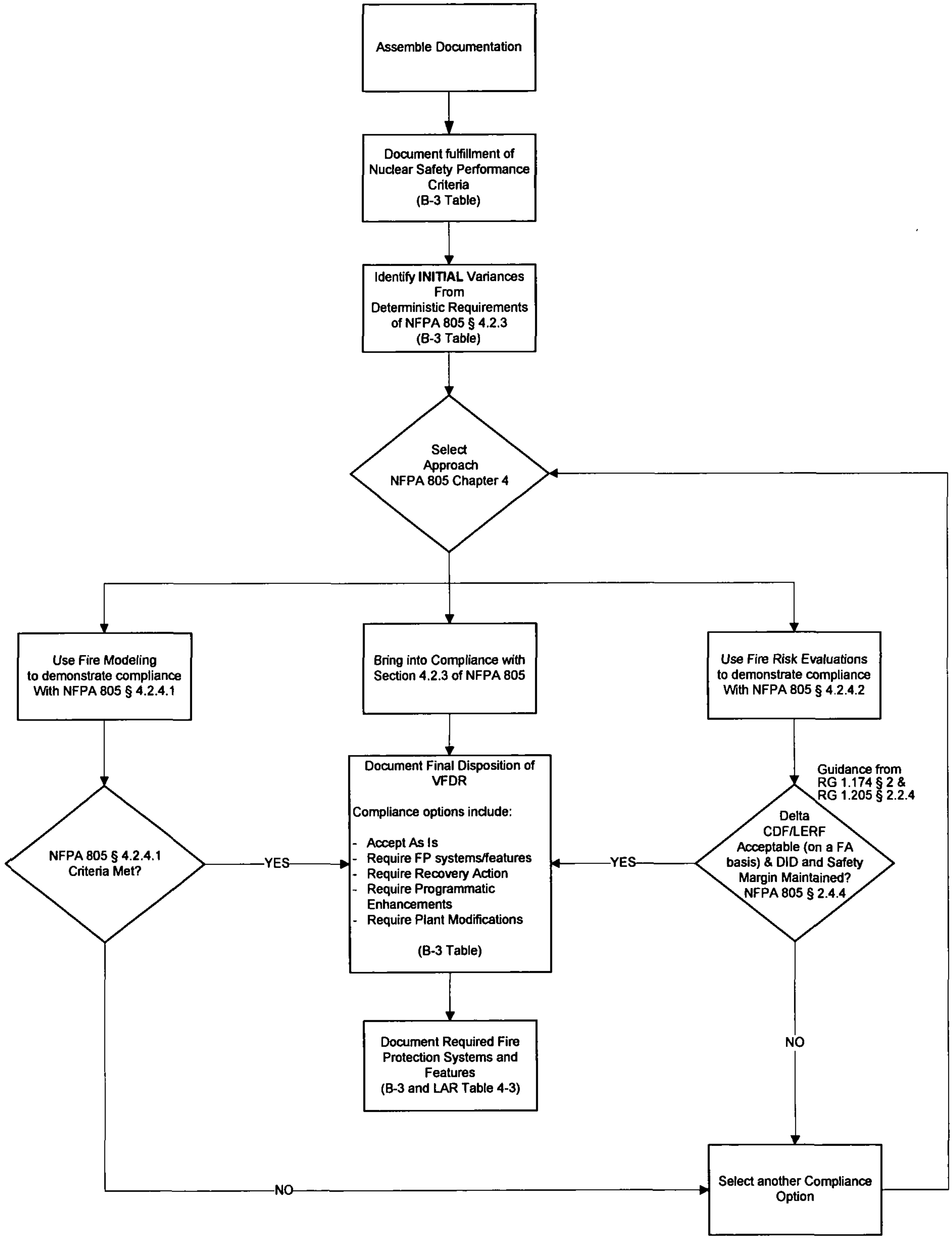

Figure 4-4 – Summary of Fire Area Review
[Based on FAQ 07-0054 Revision 1]

Results of the Evaluation Process

Attachment C contains the results of the Fire Area Transition review (NEI 04-02 Table B-3). On a fire area basis, Attachment C summarizes compliance with Chapter 4 of NFPA 805.

NEI 04-02 Table B-3 includes the following summary level information for each fire area:

- Regulatory Basis – NFPA 805 post-transition regulatory bases.
- Performance Goal Summary – An overview of the method of accomplishment of each of the performance criteria in NFPA 805 Section 1.5.
- Reference Documents – Specific references to Nuclear Safety Capability Assessment Documents.
- Licensing Actions – Specific references to safety evaluations that will remain part of the post-transition licensing basis. A brief description of the condition and the basis for acceptability of the licensing action are provided. In addition, summaries of Fire Risk Evaluations performed for variances from the deterministic requirements are also provided.
- EEEE – Specific references to EEEE that rely on determinations of "adequate for the hazard" that will remain part of the post-transition licensing basis. A brief description of the condition and the basis for acceptability are provided.
- VFDRs – Specific variances from the deterministic requirements of NFPA 805 Section 4.2.3. Refer to Section 4.5.2 for a discussion of the performance-based approach.

4.3 Non-Power Operational Modes

4.3.1 Overview of Evaluation Process

NMP1 implemented the process outlined in NEI 04-02 and FAQ 07-0040, "Non-Power Operations Clarifications." The goal (as depicted in Figure 4-5) is to ensure that contingency plans are established when the plant is in a Non-Power Operational (NPO) mode where the risk is intrinsically high. During low risk periods, normal risk management controls and fire prevention/protection processes and procedures will be utilized.

The process to demonstrate that the nuclear safety performance criteria are met during NPO modes involved the following steps:

- Review of the existing Outage Management Processes
- Identification of Equipment/Cables:
    - Review of plant systems to determine success paths that support each of the defense-in-depth Key Safety Functions (KSFs), and
    - Identification of cables required for the selected components and determination of their routing.
- Perform Fire Area Assessments (identify pinch points – plant locations where a single fire may damage all success paths of a KSF).
- Manage pinch-points associated with fire-induced vulnerabilities during the outage.

The process is depicted in Figures 4-5 and 4-6. The results are presented in Section 4.3.2.

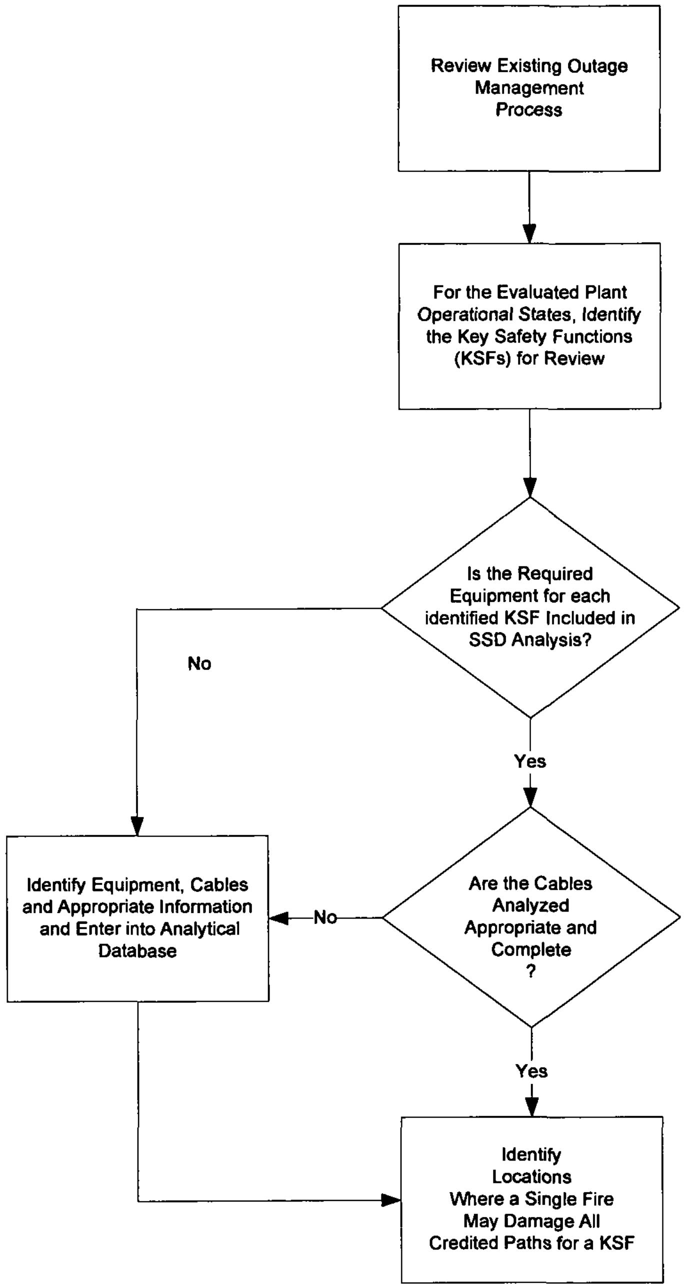

Figure 4-5 Review POSs, KSFs, Equipment, and Cables, and Identify Pinch Points

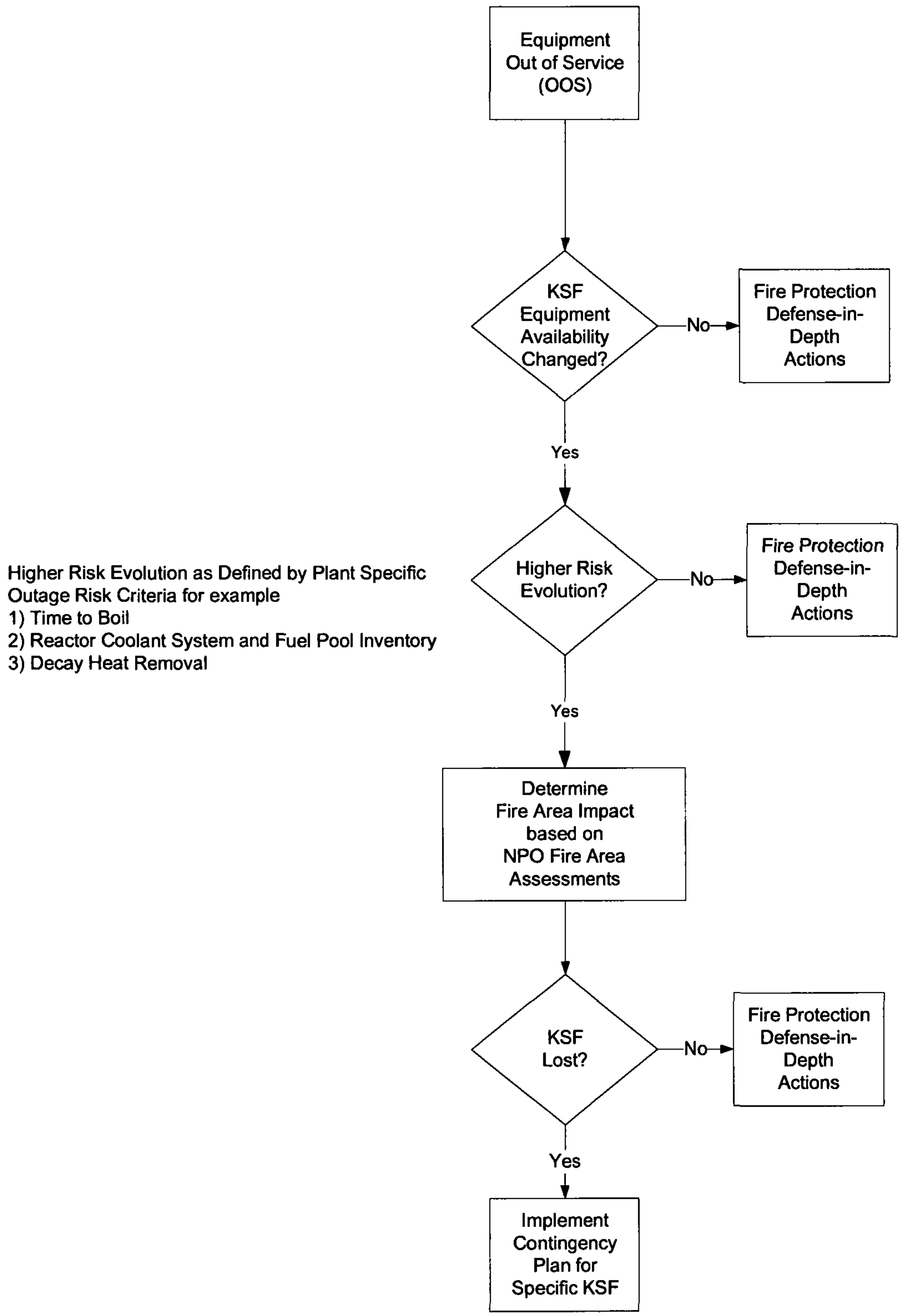

Figure 4-6 Manage Pinch Points

4.3.2 Results of the Evaluation Process

Based on FAQ 07-0040, the Plant Operating States (POSs) considered for equipment and cable selection are defined in EIR 51-9171174, Nine Mile Point 1, Non-Power Operations KSF Equipment List. The methodology for determination of KSFs, success paths, components required to achieve the success paths and their associated cabling are~~were~~ defined in EIR 51-9137629, Nine Mile Point 1 – Nuclear Power Station – NFPA 805 Transition – Non Power Operations Component Pinch Point Analysis. These documents provide the component selection information for the POSs included in the analysis (HSD, CSD, Refueling and Defueled conditions). Systems and components were identified to support the following KSFs:

- Reactor Vessel Decay Heat Removal Capability
- Spent Fuel Pool Cooling
- Reactor Vessel Inventory Control
- Spent Fuel Pool Inventory Control
- Electrical Power Availability
- Reactivity Control

KSFs are evaluated in each fire zone. Each KSF has one or more paths that satisfy the specific function. The process for selection and treatment of components is consistent with the methodology in the NSCA. Where new components are required to support KSFs, the components are included in NPO equipment list and cable identification is performed using the same methodology as that employed for the NSCA. Where NSCA equipment is also relied upon in the NPO analysis but the NPO functional requirements differed from that in the NSCA, additional reviews are performed to ensure comprehensive cable selection. Inherent in the process is identification of components potentially vulnerable to single and multiple spurious operation concerns during NPO. Note that the Reactivity Control KSF is not included in the NPO analysis because it is administratively controlled in accordance with procedure NIP-OUT-01.~~: DHR for both the Reactor Vessel and the Spent Fuel Pool (SFP), Inventory Control for both the Reactor Vessel and the SFP, and Power availability. Each may have one or more KSF paths that satisfy that specific KSF.~~

No effort is~~was~~ made to eliminate or reduce fire impact by circuit analysis; therefore, a conservative estimate of damage is provided, including hot-short induced spurious operation of equipment. By assuming that a single fire impacts any and all components in a fire zone, (whether the individual component or its associated cables are physically located within the fire zone), the assumption is made that the entire contents of the fire zone are lost.

EIR 51-9137629 contains the fire zone evaluations comprising the 'KSF pinch point' analysis. If a component that is part of a particular KSF ~~flow~~ path is impacted, it is assumed that the KSF path is lost. ~~-~~However, there are normally~~may be~~ one or more other ~~flow~~ paths within the particular KSF that are not impacted; therefore, the KSF is not considered lost and does not constitute a pinch point. Only when all paths for a particular KSF are impacted~~,~~ is the KSF itself considered lost and identified ~~is~~ as a pinch point.

The NPO analysis results (EIR 51-9137629 and EIR 51-9171174) categorize each KSF (in each fire zone), as either "I", "L" or "N" as follows:

- "I" (Impacted): At least one of the KSF paths associated with a given~~the~~ KSF is affected, i.e., a component of a specific ~~the~~ KSF path or any of the component's required cables~~its associated cables~~ within the fire zone are impacted, whereby that path can no longer be assured of being functional. However, at least one other KSF path for the ~~within that~~ KSF remains ~~is still~~ available.
- "L" (Lost): All available success paths for a given KSF are impacted.
- "N" (None): No impacts to the KSF are identified.

"Pinch Points" are ~~were then~~ identified (on a fire zone basis), based on the complete loss of a KSF. In accordance with FAQ 07-0040, any evaluated area in which all of the credited success paths for a given KSF are lost is considered a KSF pinch point. Each KSF for all Fire Zones is evaluated and documented in the pinch point analysis. The Fire Zone is labeled as ~~An~~ "N" if ~~in the pinch point column indicates that~~ no KSFs are~~were~~ lost. ~~in this fire zone.~~ The Fire Zone is labeled with a~~A~~ "Y" ~~in this column indicates that~~ if one or more KSFs are~~were~~ lost, thereby identifying that the Fire Zone contains one or more pinch points.~~in this fire zone and therefore, constitutes a pinch point.~~

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 Zone Assessment is reviewed to identify areas of single-point KSF vulnerability during HRE to develop needed contingency plans/actions. Depending upon the significance of the damage for those areas, combinations of the following options to reduce fire risk are considered at a minimum:

- Prohibition or limitation of hot work in fire areas during periods of increased vulnerability;
- Verification of functional fire detection and/or suppression in the vulnerable areas;
- Prohibition or limitation of combustible materials in fire areas during periods of increased vulnerability;
- Plant configuration changes (e.g., 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 losses of Key Safety Functions;
- Reschedule the work to a period with lower risk or higher DID;
- Identification and monitoring in-situ ignition sources for fire precursors.

In addition, KSF equipment removed from service during the HREs is evaluated. The evaluation is based on KSF equipment availability and NPO Fire Zone Assessment for any necessary contingency plans/actions. The recommendations for reducing risk can be applied as appropriate during the implementation phase (as part of the technical document and procedure review). NMP1 strategies for reducing NPO fire risk do not rely on Recovery Actions or Pre-Fire Actions (i.e., Plant Configuration Changes) as strategies for reducing NPO fire risk~~Note that recovery actions were not used to mitigate/eliminate fire-induced failures~~.

See Attachment D for more complete details. Based on incorporation of the recommendations from the KSF pinch point evaluations into appropriate plant procedures prior to implementation of the NFPA 805 fire protection program, the performance goals for NPO modes are fulfilled and the requirements of NFPA 805 will be met. See Implementation Items in Table S-2 of Attachment S.

4.4 Radioactive Release Performance Criteria

4.4.1 Overview of Evaluation Process

The review of the fire protection program against NFPA 805 requirements for fire suppression related radioactive release was performed using the methodology contained in EIR 51-9085686, NMP-1 NFPA 805 Radiological Release Transition Review. The methodology consists of the following:

- Screened the fire zones based on the potential for the presence of contaminated materials during all plant operating modes, including full power and non-power conditions. The screening process considered input from radiation protection personnel and review of the NMP1 fire pre-plans. The evaluation focused on radioactive release to any unrestricted area due to firefighting activities.
- Reviewed fire pre-plans and fire brigade training materials to identify fire protection program elements (e.g., systems / components / procedural control actions / flow paths, etc.) that are being credited to meet the radioactive release

goals, objectives, and performance criteria during all plant operating modes, including full power and non-power conditions.

- Reviewed engineering controls to ensure containment of gaseous and liquid effluents (e.g., smoke and fire fighting agents). This review included all plant

REVISIONS TO TRANSITION REPORT

TABLE 4-3, SUMMARY OF NFPA 805 COMPLIANCE BASIS AND REQUIRED FIRE PROTECTION SYSTEMS AND FEATURES

Pages 54 through 60 with changes highlighted.

Table 4-3 Summary of NFPA 805 Compliance Basis and Required Fire Protection Systems and Features

Fire Area	Fire Zone	Description	NFPA 805 Regulatory Basis	Required Suppression System (S, E, R, D)[2]	Required Detection System (S, E, R, D)[2]	Required Fire Protection Feature (S, E, R, D)[2]	Required Fire Protection Feature and System Details[1]
1		**Reactor Building East EL 198-0 thru EL 340-0**	**4.2.4.2[3]**				
1	FBZR237N	Reactor Building EL 237-0 COL N-Q, ROW 8-9		S,R	S,R	None	Water Pre-Action Sprinkler, Detection
1	FBZR261N	Reactor Building EL 261-0 COL N-Q, ROW 8-9		S,R	S,R	None	Water Pre-Action Sprinkler, Detection
1	FBZR281N	Reactor Building EL 281-0 COL M-Q, ROW 6-7		S,R	S,R	None	Water Pre-Action Sprinkler, Detection
1	FBZR281S	Reactor Building EL 281-0 COL K-L, ROW 7-8		S,R	S,R	None	Water Pre-Action Sprinkler, Detection
1	FBZR298N	Reactor Building EL 298-0 COL N-Q, ROW 7.5-8.5		S,R	S,R	None	Water Pre-Action Sprinkler, Detection
1	FBZR298S	Reactor Building EL 298-0 COL K-L, ROW 7-8		S,R	S,R	None	Water Pre-Action Sprinkler, Detection
1	FBZR318N	Reactor Building EL 318-0 COL M-Q, ROW 6-7		S,R	S,R	None	Water Pre-Action Sprinkler, Detection
1	FBZR318S	Reactor Building EL 318-0 COL K-M, ROW 6-7		S,R	S,R	None	Water Pre-Action Sprinkler, Detection
1	FBZR340N	Reactor Building EL 340-0 COL M-Q, ROW 6-7		None	D	None	Detection
1	FBZR340S	Reactor Building EL 340-0 COL L-N, ROW 7-8		None	D	None	Detection
1	R1A	CTS Pump Room And General Floor Area East EL 198-0 & 237-0		D	R	None	Water Pre-Action Sprinkler, Detection
1	R1C	Access Stairwell Southeast EL 237-0 & 261-0		None	D	None	Detection
1	R1D	CS Pump Room And Protective Clothing Change Area EL 198-0 & 237-0		D	D	None	Water Pre-Action Sprinkler, Detection
1	R2A	General Floor Area East EL 261-0		D	R	None	Water Pre-Action Sprinkler, Detection
1	R3A	General Floor Area East EL 281-0		None	~~R~~D	None	Detection
1	R4A	General Floor Area East EL 298-0		None	D	None	Detection
1	R4C	Emergency Condenser Isolation Valve Room EL 298-0		D	D	None	Halon Suppression System, Detection
1	R5A	General Floor Area East EL 318-0		None	D	None	Detection
1	R6A	General Floor Area East EL 340-0		None	D	None	Detection
2		**Reactor Building West EL 198-0 thru EL 340-0**	**4.2.4.2[3]**				
2	FBZR237N	Reactor Building EL 237-0 COL N-Q, ROW 8-9		S,R	S,R	None	Water Pre-Action Sprinkler, Detection
2	FBZR261N	Reactor Building EL 261-0 COL N-Q, ROW 8-9		S,R	S,R	None	Water Pre-Action Sprinkler, Detection
2	FBZR281N	Reactor Building EL 281-0 COL M-Q, ROW 6-7		S,R	S,R	None	Water Pre-Action Sprinkler, Detection

Table 4-3 Summary of NFPA 805 Compliance Basis and Required Fire Protection Systems and Features

Fire Area	Fire Zone	Description	NFPA 805 Regulatory Basis	Required Suppression System (S, E, R, D)[2]	Required Detection System (S, E, R, D)[2]	Required Fire Protection Feature (S, E, R, D)[2]	Required Fire Protection Feature and System Details[1]
2	FBZR281S	Reactor Building EL 281-0 COL K-L, ROW 7-8		S,R	S,R	None	Water Pre-Action Sprinkler, Detection
2	FBZR298N	Reactor Building EL 298-0 COL N-Q, ROW 7.5-8.5		S,R	S,R	None	Water Pre-Action Sprinkler, Detection
2	FBZR298S	Reactor Building EL 298-0 COL K-L, ROW 7-8		S,R	S,R	None	Water Pre-Action Sprinkler, Detection
2	FBZR318N	Reactor Building EL 318-0 COL M-Q, ROW 6-7		S,R	S,R	None	Water Pre-Action Sprinkler, Detection
2	FBZR318S	Reactor Building EL 318-0 COL K-M, ROW 6-7		S,R	S,R	None	Water Pre-Action Sprinkler, Detection
2	FBZR340N	Reactor Building EL 340-0 COL M-Q, ROW 6-7		None	D	None	Detection
2	FBZR340S	Reactor Building EL 340-0 COL L-N, ROW 7-8		None	D	None	Detection
2	R1B	CTS Pump Room, CS Pump Room, General Floor Area West EL 198-0 & 237-0		None	R	None	Detection
2	R2B	General Floor Area West EL 261-0		D	R	None	Water Pre-Action Sprinkler, Detection
2	R2C	Shutdown Cooling Room EL 261-0		None	D	None	Detection
2	R2D	Reactor Building Track Bay EL 261-0		D	None	None	Dry Pipe System
2	R3B	General Floor Area West EL 281-0		None	E,R	None	Detection
2	R4B	General Floor Area West EL 298-0		None	D	None	Detection
2	R4C	Emergency Condenser Isolation Valve Room EL 298-0		D	D	None	Halon Suppression System, Detection
2	R5B	General Floor Area West EL 318-0		D	D	None	Water Pre-Action Sprinkler, Detection
2	R6B	General Floor Area West EL 340-0		None	D	None	Detection
3		**Drywell EL 237-0 thru 318-0**	**4.2.3.1**				
3	R1	Drywell EL 237 – 318		None	None	None	
4		**Foam Room EL 261-0**	**4.2.4.2[3]**				
4	AB1F	Foam Room EL 261-0		None	~~R~~D	None	Detection
5		**Turbine Building EL 240-0 thru 369-0**	**4.2.4.2[3]**				
5	FBZT261N	Turbine Building Fire Break Zone North EL 261-0		E,R	E,R	None	Water Pre-Action Sprinkler, Detection
5	FBZT261S	Turbine Building Fire Break Zone South EL 261-0		E,~~R~~D	E,~~R~~D	None	Water Pre-Action Sprinkler, Detection
5	OG1	General Floor Area EL 232-0		None	E,D	None	Detection

Table 4-3 Summary of NFPA 805 Compliance Basis and Required Fire Protection Systems and Features

Fire Area	Fire Zone	Description	NFPA 805 Regulatory Basis	Required Suppression System (S, E, R, D)[2]	Required Detection System (S, E, R, D)[2]	Required Fire Protection Feature (S, E, R, D)[2]	Required Fire Protection Feature and System Details[1]
5	OG2	General Floor Area EL 247-0		None	E,D	None	Detection
5	OG3	General Floor Area EL 261-0		E,D	E,R	None	Wet Pipe System, Detection
5	T1	Turbine Condenser/Heater Bay Area EL 250-0		E,R	E,R	None	Deluge System, CO_2 required for risk, Detection
5	T1A	Turbine Building EL 240-261 MSIV Room & Steam Tunnel		None	None	None	
5	T3A	General Floor Area East of MSIV Room and Fire Zone T1 EL 261-318		E,R,D	E,R	None	Water Pre-Action Sprinkler, Wet and Dry Pipe System, CO_2 required for DID, Detection
5	T3B	General Floor Area West of MSIV Room; Also South And West Of Fire Zone 1 EL 237-0 & 261-0		E,R,D	E,R	~~None~~S	Water Pre-Action Sprinkler, CO_2 required for DID, Detection, Promat-H enclosure for the HVAC duct
5	T4A	General Floor Area East Of Fire Zone T1 EL 277-0		E,R	E,R	None	Water Pre-Action Sprinkler, Wet Pipe and Deluge System, Detection
5	T4B	General Floor Area West Of Fire Zone T1 EL 277-0		E,D	E,R	None	Water Pre-Action Sprinkler, Wet Pipe System, Detection
5	T4C	Hydrogen Seal Oil Unit Room EL 277-0		E,R,D	E,R	None	Deluge System, CO_2 required for DID, Detection
5	T4D	Battery Room EL 277		None	E,D	None	Detection
5	T5A	General Floor Area North EL 291-0		E,D	E,D	None	Wet Pipe System, Detection
5	T6A	General Floor Area North EL 305-6		E,D	E,R	None	Wet Pipe System, CO_2 required for DID, Detection
5	T6B	Turbine Laydown Area East EL 300-0		None	E,D	None	Detection
5	T6C	General Floor Area South EL 300-0		E,D	E,D	None	Deluge System, Detection
5	T6D	Mechanical Storage Area EL 300-0		E,D	E,D	None	Water Pre-Action Sprinkler, Detection
5	T7A	General Floor Area South EL 320-0		None	E,D	None	Detection
5	T8A	General Floor Area North EL 333-0, General Floor Area North EL 351-0, General Floor Area East EL 369		E,D	E,D	None	Wet Pipe System, Detection
5	T8B	General Floor Area West EL 369-0		None	E,D	None	Detection
6		**Turbine Building North EL 250-0**	**4.2.4.2[3]**				
6	T2A	Turbine Building EL 250-0		R	E,R	None	Water Pre-Action Sprinkler, Detection

Table 4-3 Summary of NFPA 805 Compliance Basis and Required Fire Protection Systems and Features

Fire Area	Fire Zone	Description	NFPA 805 Regulatory Basis	Required Suppression System (S, E, R, D)[2]	Required Detection System (S, E, R, D)[2]	Required Fire Protection Feature (S, E, R, D)[2]	Required Fire Protection Feature and System Details[1]
7		**Turbine Building South & West EL 250-0**	**4.2.4.2[3]**				
7	T2B	Turbine Building South And West EL 250-0		R	R	None	Water Pre-Action Sprinkler, Detection
7	T2E	UPS Battery Room EL 250		None	D	None	Detection
9		**Turbine Building East EL 250-0**	**4.2.4.2[3]**				
9	T2C	Turbine Building Offgas Tunnel EL 250-0		None	D	None	Detection
9	T2D	Turbine Building General Area East EL 250-0		R	R	None	Water Pre-Action Sprinkler, Detection
10		**Cable Spreading Room EL 250-0**	**4.2.4.2[3]**				
10	C1	Cable Spreading Room EL 250-0		E,R,D	E,R	None	Water Pre-Action Sprinkler, CO_2 required for DID, Detection
11		**Control Complex EL 261-0 And EL 277-0**	**4.2.4.2[3]**				
11	C2	Auxiliary Control Room, Computer Room 261-0		R,D	E,R	~~None~~S	Halon Suppression System, CO_2 required for DID, Detection, Promat-H enclosure for the HVAC duct
11	C3	Control Room EL 277-0		None	E,R	None	Detection
12		**Administration Building EL 250-0**	**4.2.4.2[3]**				
12	AB1A	Records Storage Area EL 250-0		None	D	None	Detection
12	AB1B	SAS Equipment Area EL 252-0		D	D	None	Halon Suppression System, Detection
12	AB1C	CPU Equipment Area EL 252-0		D	D	None	Halon Suppression System, Detection
12	AB1D	General Area EL 250-0		D	D	None	Wet Pipe System, Detection
12	AB1E	Locker Area, Lunch Room, Offices EL 261-0		D	D	None	Wet Pipe System, Detection
12	AB2A	Access Passageway EL 248-0		D	None	None	Wet Pipe System
12	AB2B	Technical Support Area EL 248-0		D	D	None	Wet Pipe System, Detection
12	AB2C	Radiation Records Area EL 248-0		D	D	None	Wet Pipe System, Detection
12	AB2D	Warehouse Area EL 248-0		D	None	None	Wet Pipe System
12	AB3A	Warehouse Area EL 261-0		D	None	None	Wet Pipe System

Table 4-3 Summary of NFPA 805 Compliance Basis and Required Fire Protection Systems and Features

Fire Area	Fire Zone	Description	NFPA 805 Regulatory Basis	Required Suppression System (S, E, R, D)[2]	Required Detection System (S, E, R, D)[2]	Required Fire Protection Feature (S, E, R, D)[2]	Required Fire Protection Feature and System Details[1]
12	AB3B	Oil Storage Room EL 261-0		D	None	None	Wet Pipe System
12	AB3C	Storeroom Truck Dock EL 261-0		D	None	None	Dry Pipe System
12	AB3D	Electrical/Mechanical Shop Area, Office Areas, Locker Rooms EL 261-0		~~D~~R	~~D~~R	None	Wet Pipe System, Detection
12	AB3E	Telephone Room 1 EL 261-0		D	D	None	Halon Suppression System, Detection
12	AB3F	Telephone Room 2 EL 261-0		D	D	None	Halon Suppression System, Detection
12	AB4A	General Office Area EL 277-0		D	D	None	Wet Pipe System, Detection
12	AB4B	File Room EL 277-0		D	D	None	Water Pre-Action Sprinkler, Detection
12	AB4C	Records Processing Area EL 277-0		R	R	None	Water Pre-Action Sprinkler, Detection
12	AB4D	General Office Area EL 277-0		R	R	None	Wet Pipe System, Detection
12	AB5	Penthouse Ventilation Room EL 290-0		D	D	None	Deluge System, Detection
13		**Screenhouse**	**4.2.4.2[3]**				
13	S1	Screenhouse EL 225-0 – 256-0		S,D	R	None	Dry Pipe System, Detection
14		**Diesel Fire Pump Room EL 261-0**	**4.2.4.2[3]**				
14	S2	Diesel Fire Pump Room EL 256-0		S,D	S,D	None	Wet Pipe System required for Chapter 3, Section 3.9.4, compliance;~~Dry Pipe System~~, Detection
15		**Radwaste And Waste Disposal Buildings EL 252-0 thru 292-0**	**4.2.4.2[3]**				
15	RS1A	Drum Waste Storage Vaults EL 252-0		None	None	None	
15	RS1B	Electrical Equipment Room EL 252-0		D	D	None	Halon Suppression System, Detection
15	RS1C	General Floor Area South, Drum Storage Room EL 252-0		None	D	None	Detection
15	RS2A	Truck Loading Area, North EL 261-0		D	None	None	Dry Pipe System
15	RS2B	Truck Loading Area, West EL 261-0		D	None	None	Dry Pipe System
15	RS2C	General Floor Area EL 261-0		D	D	None	Dry-pipe System, Detection

Table 4-3 Summary of NFPA 805 Compliance Basis and Required Fire Protection Systems and Features

Fire Area	Fire Zone	Description	NFPA 805 Regulatory Basis	Required Suppression System (S, E, R, D)[2]	Required Detection System (S, E, R, D)[2]	Required Fire Protection Feature (S, E, R, D)[2]	Required Fire Protection Feature and System Details[1]
15	RS2D	Radwaste Control Room, West EL 261-0		D	D	None	Halon Suppression System, Detection
15	RS2E	General Floor Area, South EL 261-0		None	None	None	
15	RS3A	General Floor Area, West EL 281-0		None	D	None	Detection
15	RS4A	General Floor Area, Northwest EL 292-0		D	D	None	Deluge System, Detection
15	RS5B	General Floor Area, Southwest EL 292-0		None	D	None	Detection
15	WD1	General Area EL 225-0 & 229-0		None	D	None	Detection
15	WD2	General Area EL 247-0		None	D	None	Detection
15	WD3A	General Area EL 261-0		D	D	None	Water Pre-Action Sprinkler, Detection
15	WD3B	Radwaste Control Room EL 261-0		None	D	None	Detection
15	WD3C	Baler Room EL 261-0		D	D	None	Dry Pipe System, Detection
15	WD3D	Dow Solidification Area EL 261-0		D	D	None	Dry Pipe System, Detection
15	WD3E	Truck Bay EL 261-0		E,D	E,D	None	Dry Pipe System, Detection
15	WD4	Waste Building Ventilation Area EL 277-0		None	D	None	Detection
16A		**Battery Board Room 12 EL 261-0**	**4.2.4.2[3]**				
16A	B1A	Battery Board Room 12 EL 261-0		None	E,D	None	Detection
16B		**Battery Board Room 11 EL 261-0**	**4.2.4.2[3]**				
16B	B1B	Battery Board Room 11 EL 261-0		None	E,D	None	Detection
17A		**Battery Room 12 EL 277-291**	**4.2.4.2[3]**				
17A	B2A	Battery Room 12 EL 277-0		None	E,D	None	Detection
17B		**Battery Room 11 EL 277-291**	**4.2.4.2[3]**				
17B	B2B	Battery Room 11 EL 277-0		None	E,D	None	Detection
18		**Emergency Diesel Generator 102 Missile Enclosure EL 271**	**4.2.4.2[3]**				
18	D3	EDG 102 Control Cable Missile Enclosure EL 271-0		None	E,D	~~None~~S	Detection, Promat-H enclosure

Table 4-3 Summary of NFPA 805 Compliance Basis and Required Fire Protection Systems and Features

Fire Area	Fire Zone	Description	NFPA 805 Regulatory Basis	Required Suppression System (S, E, R, D)[2]	Required Detection System (S, E, R, D)[2]	Required Fire Protection Feature (S, E, R, D)[2]	Required Fire Protection Feature and System Details[1]
19		**Emergency Diesel Generator 103 Foundation Room EL 250-0 and Diesel Generator Room El 261-0**	4.2.4.2[3]				
19	D1A	EDG 103 Foundation Room EL 250-0		E,D	E,D	None	Water Pre-Action Sprinkler, Detection
19	D2A	EDG 103 Room EL 261-0		R	E,R	None	CO_2 System, Detection
20		**Diesel Generator Enclosed Cableway EL 250-0**	4.2.4.2[3]				
20	D1C	EDG 103 Cable Routing Area EL 250-0		D	D	None	Water Pre-Action Sprinkler, Detection
21		**Below Powerboards 102 & 103 EL 250-0**	4.2.4.2[3]				
21	D1D	Room Below PB's 102 & 103 EL 250-0		D	D	None	Water Pre-Action Sprinkler, Detection
22		**Emergency Diesel Generator 102 Foundation Room EL 250-0 and Diesel Generator Room EL 261-0**	4.2.4.2[3]				
22	D1B	EDG 102 Foundation Room EL 250-0		E,D	E,D	None	Water Pre-Action Sprinkler, Detection
22	D2B	EDG 102 Room EL 261-0		R	E,R	None	CO_2 System, Detection
23		**Power Board 102 Room EL 261-0**	4.2.4.2[3]				
23	D2C	Power Board 102 Room EL 261-0		D	E,R	None	CO_2 System, Detection
24		**Power Board 103 Room EL 261**	4.2.4.2[3]				
24	D2D	Power Board 103 Room EL 261-0		D	E,R	None	CO_2 System, Detection
EXT		**External to Plant**	4.2.3.1[3]				
EXT	EXT	External to Plant		E	E	None	Deluge System, Detection

Notes:
1. Refer to Attachment C for each area and additional information
2. NR – Not Required; S – Required for Separation; E – Required for Engineering Evaluation; R – Required for Risk; D – Required for Defense-in-Depth
3. Compliance includes reliance on simplifying deterministic assumptions

REVISIONS TO TRANSITION REPORT ATTACHMENT A

NEI 04-02 TABLE B-1, TRANSITION OF FUNDAMENTAL FIRE PROTECTION PROGRAM & DESIGN ELEMENTS

Pages A-42 through A-44 with changes highlighted.

Chapter 3 Reference and Requirements/Guidance	Compliance Statement	Compliance Bases	Reference Documents
3.5.16 The fire protection water supply system shall be dedicated for fire protection use only. Exception No. 1: Fire protection water supply systems shall be permitted to be used to provide backup to nuclear safety systems, provided the fire protection water supply systems are designed and maintained to deliver the combined fire and nuclear safety flow demands for the duration specified by the applicable analysis. Exception No. 2: Fire protection water storage can be provided by plant systems serving other functions, provided the storage has a dedicated capacity capable of providing the maximum fire protection demand for the specified duration as determined in this section.	Complies with Clarification based on Exception No. 1	In addition to fire protection use, N1-SD-018 and the UFSAR describe the following non-fire protection, nuclear safety / emergency uses of the fire protection water supply system: a. Provide a source of make-up water to the emergency condenser make-up tanks. b. Provide an emergency source of water for containment and reactor vessel flooding. c. Provide an emergency source of make-up water to the spent fuel pool. d. Provide a back-up water source for the emergency service water system. e. Provide a back-up water source for the diesel generator cooling water system. The following additional considerations apply to non-fire protection uses described above: a. Use of the electric motor-driven or diesel engine-driven fire pump as a source of emergency make-up to the emergency condenser make-up tanks would not be required for a minimum of 8-hours~~48-hours~~ after depletion of the emergency condenser inventory, assuming worst case conditions in which the CST inventories are unavailable due to fire damage to the CST transfer system. If the CST transfer system is available, emergency condenser makeup using a fire pump is not required for a minimum of 48-hours. ~~and CST inventories. Therefore,~~ In either case, concurrent fire protection use is unlikely.	N1-SD-018, Rev. 05, Sec. 1.0 UFSAR Sec. X.N, Appendix 10A, Rev. 21, Sec. 2.5, pg. 10A-29 UFSAR Sec. X.N, Appendix 10B, Rev. 21, Appendix D, Sec. 1.c, pg. 10B-220 Calculation S13.1-100F005, "Diesel Fire Pump / Reactor Vessel Flooding," Rev. 0, All Calculation S13.1-100F006," Pressure Drop Calculation, NMP2 Main Fire Pumps Supply to NMP1 Fire Water Distribution System," Rev. 0, All Calculation 13.1-100F007, "Hydraulic Analysis of Diesel Fire Pump Supply to ESW #11 and Emergency Diesel Cooling Water Systems," Rev. 0, All

Chapter 3 Reference and Requirements/Guidance	Compliance Statement	Compliance Bases	Reference Documents
3.5.16 (cont.)		**(cont.)** b. Use of the electric motor-driven or diesel engine-driven fire pump for emergency containment and reactor vessel flooding would only be required in the unlikely event that all other means of core injection are lost. On this basis, concurrent fire protection use is unlikely. c. Use of the electric motor-driven or diesel engine-driven fire pump as a source of emergency spent fuel pool inventory would only be required upon loss of the Fuel Pool Make-up System, condensate transfer via hoses, and demineralized water with hoses from refueling service connections. On this basis, concurrent fire protection use is unlikely. d. and e. Use of the diesel engine-driven fire pump as a source of ESW and EDG cooling water would only be required upon occurrence of a fire in the Screenhouse that could disable all other Screenhouse pumps. **Clarification:** The required flow rate and pressure demand for each of the non-fire protection, nuclear safety / emergency uses of the fire protection water supply system described above can be supplied by use of one (1) of the redundant fire pumps. Therefore, in the unlikely event that concurrent fire protection and non-fire protection use is required, either the remaining Unit 1 fire pump, or the Unit 2 fire protection water supply system will be available. To ensure adequate water supply for fire suppression activities concurrent with other uses, a modification for a cross-connection will be installed. See modifications in Attachment S.	

Chapter 3 Reference and Requirements/Guidance	Compliance Statement	Compliance Bases	Reference Documents
3.5.16 (cont.)		**(cont.)** Additionally, since the source of the Unit 1 and Unit 2 fire protection water supply is Lake Ontario, the water available to supply fire protection and/or non-fire protection demands is not a concern.	
3.6 Standpipe and Hose Stations.	N/A	N/A - Section title, no technical requirements. See sub-sections for specific compliance statements and references.	
3.6.1 For all power block buildings, Class III standpipe and hose systems shall be installed in accordance with NFPA 14, Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems.	Complies with use of EEEE	Standpipe and hose systems are provided for all power block structures. Per N1-SD-018, standpipe risers are located at various points throughout Nine Mile Point Unit 1 to serve hose stations. The standpipes/hose stations are so spaced as to permit hose stream coverage of all points in the buildings including primary containment. Hose stations are equipped with 100 feet of 1-1/2 inch hose with adjustable spray nozzles. Hose stream coverage is in accordance with NFPA 14 Class III systems.	N1-SD-018, Rev. 05, Sec. 2.2.5 UFSAR Sec. X.N, Appendix 10A, Rev. 21, Sec. 2.5.3.4, Table 1.2.2, pgs. 10A-46, 10A-47, 10A-86 FPEE 0-98-003, “Acceptable Use of Aluminum Fire Hose Couplings,” Rev. 0 EIR 51-9077284-000, “NMP-1 Code Reviews,” Sec. 4.0, Appendix F
3.6.2 A capability shall be provided to ensure an adequate water flow rate and nozzle pressure for all hose stations. This capability includes the provision of hose station pressure reducers where necessary for the safety of plant industrial fire brigade members and off-site fire department personnel.	Complies	Based on the fire protection water supply design information contained in S13.1-100F002, the NMP1 fire protection water supply system is capable of providing adequate flow and pressure for all hose stations and exceeds NFPA 14-1963 design requirements. Pressure reduction devices are not installed for hose stations. This has been deemed acceptable because fire hoses connected to the standpipe system are intended for use exclusively by trained fire brigade personnel.	S13.1-100F002, “Fire Protection Water Supply,” Rev. 02 UFSAR Sec. X.N, Appendix 10A, Rev. 21, Sec. 2.5.3.4, Table 1.2.2, pgs. 10A-46, 10A-47, 10A-86

REVISIONS TO TRANSITION REPORT ATTACHMENT B

NEI 04-02 TABLE B-2, NUCLEAR SAFETY CAPABILITY ASSESSMENT - METHODOLOGY REVIEW

Pages B-1 through B-102 with changes highlighted.

B. NEI 04-02 Table B-2 – Nuclear Safety Capability Assessment - Methodology Review

101 Pages Attached

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

A comprehensive list of systems and equipment and their interrelationships to be analyzed for a fire event shall be developed. The equipment list shall contain an inventory of those critical components required to achieve the nuclear safety performance criteria of Section 1.5. Components required to achieve and maintain the nuclear safety functions and components whose fire-induced failure could prevent the operation or result in the mal-operation of those components needed to meet the nuclear safety criteria shall be included. Availability and reliability of equipment selected shall be evaluated.

NEI 00-01 Ref	NEI 00-01 Guidance
3 Deterministic Methodology	This section discusses a generic deterministic methodology and criteria that licensees can use to perform a post-fire safe shutdown analysis to address regulatory requirements. For a complete understanding of the deterministic requirements, work this section in combination with the information in Appendix C, High/Low Pressure Interfaces, Appendix D, Alternative and Dedicated Shutdown Requirements, Appendix E, Acceptance Criteria for Operator Manual Actions and repairs, and Appendix H, Hot Shutdown versus Important to Safe Shutdown Components. To resolve the industry issue related to MSOs, refer to Section 4, Appendix B, Appendix F and Appendix G. The plant specific analysis approved by NRC is reflected in the plant's licensing basis. The methodology described in this section is an acceptable method of performing a post-fire safe shutdown analysis. This methodology is depicted in Figure 3-1. Other methods acceptable to NRC may also be used. Regardless of the method selected by an individual licensee, the criteria and assumptions provided in this guidance document may apply. The methodology described in Section 3 is based on a computer database oriented approach, which is utilized by several licensees to model Appendix R data relationships. This guidance document, however, does not require the use of a computer database oriented approach.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

This document addresses the comparison of the deterministic methodology used for the existing the Nine Mile Point 1 (NMP1) Safe Shutdown Analysis and the requirements of 10CFR50 Appendix R, Sections III.G.1, III.G.2 and III.G.3 against the compliance requirements and criteria specified in NFPA 805. The subsequent sections determine the extent the analysis meets the requirements as described in NEI 04-02. This documents a line by line review and comparison against the methodology and criteria provided in Chapter 3 of NEI 00-01, Revision 2. The deterministic methodology described in Section 3 and Figure 3-1 of NEI 00-01 was utilized as documented in the following Table B-2 sections. The NMP1 safe shutdown methodology utilizes a computer oriented database to model data relationships for systems, components, and cables used to comply with the requirements for post fire safe shutdown. This review of modifications, procedural controls, repair procedures and previously approved configurations and boundaries demonstrates that the safe shutdown analysis generally meets the Nuclear Safety Performance Criteria including the information provided in Appendix B of NFPA 805 related to circuit criteria and Multiple Spurious Operations (MSOs).

Reference Document

EIR 51-9133191, NSCA, Section 9.0

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance

3.1 Safe Shutdown Systems and Path Development	This section discusses the identification of systems necessary to perform the required safe shutdown functions. It also provides information on the process for combining these systems into safe shutdown paths. Appendix R Section III.G.1.a requires that the capability to achieve and maintain hot shutdown be free of fire damage. Appendix R Section III.G.1.b requires that repairs to systems and equipment necessary to achieve and maintain cold shutdown be completed within 72 hours. This section provides some guidance on classifying components as either required or important to SSD circuit components. It also provides some guidance on the tools available for mitigating the effects of fire-induced circuit failures to each of these classes of equipment. For a more detailed discussion of the topic of required and important to SSD components refer to Appendix H.
	
	The goal of post-fire safe shutdown is to assure that a one train of shutdown systems, structures, and components remains free of fire damage for a single fire in any single plant fire area. This goal is accomplished by determining those functions required to achieve and maintain hot shutdown. Safe shutdown systems are selected so that the capability to perform these required functions is a part of each safe shutdown path. The functions required for post-fire safe shutdown generally include, but are not limited to the following:
	
	▪ Reactivity control
	▪ Pressure control systems
	▪ Inventory control systems
	▪ Decay heat removal systems
	▪ Process monitoring (as defined in NRC Information Notice 84-09)
	▪ Support systems
	    ▪ Electrical power and control systems
	    ▪ Component Cooling systems
	    ▪ Component Lubrication systems
	
	These functions are of importance because they have a direct bearing on the safe shutdown goal of being able to achieve and maintain hot shutdown, which ensures the integrity of the fuel, the reactor pressure vessel and the primary containment. If these functions are preserved, then the plant will be safe because the fuel, the reactor and the primary containment will not be damaged. By assuring that this equipment is not damaged and remains functional, the protection of the health and safety of the public is assured.
	
	The components required to perform these functions are classified as required for hot shutdown components. These components are necessary and sufficient to perform the required safe shutdown functions assuming that fire-induced impacts to other plant equipment/cables do not occur. Since fire-induced impacts to other plant equipment/cables can occur in the fire condition, these impacts must also be addressed. The components not necessary to complete the required safe shutdown functions, but which could be impacted by the fire and cause a subsequent impact to the required safe shutdown components are classified as either required for hot shutdown or important to SSD components. Depending on the classification of the components, the tools available for mitigating the effects of fire-induced damage vary. The available tools are generally discussed in this section and in detail in Appendix H. The classification of a component or its power or control circuits may vary from fire area to fire area. Therefore, the required safe shutdown path for any given fire area is comprised of required for hot shutdown components and important to SSD components. The distinction and classification for each required safe shutdown path for each fire area should be discernible in the post-fire safe shutdown analysis.
	Generic Letter 81-12 specifies consideration of associated circuits of concern with the potential for spurious equipment operation and/or loss of power source, and the common enclosure failures. As described above, spurious operations/actuations can affect the accomplishment of the required safe shutdown functions listed above. Typical examples of the effects of the spurious operations of concern are the following:

- A loss of reactor pressure vessel/reactor coolant inventory in excess of the safe shutdown makeup capability.
- A flow loss or blockage in the inventory makeup or decay heat removal systems being used for the required safe shutdown path.

Spurious operations are of concern because they have the potential to directly affect the ability to achieve and maintain hot shutdown, which could affect the fuel and cause damage to the reactor pressure vessel or the primary containment. To address the issue of multiple spurious operations, Section 4 provides a Resolution Methodology for developing a Plant Specific List of MSOs for evaluation. Appendix B provides the circuit failure criteria applicable to the evaluation of the Plant Specific list of MSOs.

Common power source and common enclosure concerns could also affect the safe shutdown path and must be addressed.

In addition to the tools described for components classified as required for hot shutdown, fire-induced impacts to cables and components classified as important to SSD may be mitigated using some additional tools. For important to SSD component failures, operator manual actions, fire modeling and/or a focused-scope fire PRA may be used to mitigate the impact. (If the use of a Focused-Scope Fire PRAs is not permitted in the Plants Current License Basis, then, a License Amendment Request (LAR) will be necessary to use the Focused-Scope Fire PRA).

Applicability	**Comments**
Applicable	None

Alignment Statement

Aligns

Alignment Basis

To achieve post-fire safe shutdown, the Safe Shutdown Systems, their functions, and components required to support the safe shutdown functions were identified. P&IDs and Electrical drawings were marked up and annotated to select equipment and specific flow paths for each system required to support safe shutdown. This information was populated into a computer database to provide a database oriented approach to model Appendix R data relationships.

Safe shutdown systems, components, and cables were selected using the criteria and assumptions of NEI 00-01, Rev. 2, Sections 3.1.1 and 3.1.2 to satisfy each safe shutdown function performance goals, including process monitoring and support systems for each path. NEI 00-01 was used as the guidance in developing the Safe Shutdown Equipment List and the Safe Shutdown success paths. Safe Shutdown paths were designed based on the combination of systems in the respective fire area.

The ability to achieve post-fire Safe Shutdown (SSD) is assured by having at least one safe shutdown path of the required systems, structures, and components to remain free of fire damage. This assurance that the safe shutdown equipment is available supports the required performance goals identified in the guidance, maintains the integrity of the fuel, reactor pressure vessel and primary containment. The SSD path used to achieve post-fire safe shutdown is comprised of SSD systems and components that remain free of fire damage.

Reference Document

EIR 51-9133191, NSCA, Sections 4.0, 5.0, 5.1, 5.2, 8.6.2, and 8.6.3
HNP RAI 3-6, RAI 3-9, RAI 3-10, and RAI 3-11, NRC Requests for Additional Information dated August 6, 2009 (ML092170715)
Closure of National Fire Protection Association 805 Transition Program Frequently Asked Question Number 06-0006 (ML070030117)
ONS RAI 3-35, NRC Request for Additional Information dated November 18, 2009 (ML092920347)

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.1 Criteria/Assumptions	The following criteria and assumptions should be considered, as applicable, when identifying systems available and necessary to perform the required safe shutdown functions and combining these systems into safe shutdown paths. This list provides recognized examples of criteria/assumptions but should not be considered an all-inclusive list. The final set of criteria/assumptions should be based on regulatory requirements and the performance criteria for post-fire safe shutdown for each plant.

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

This paragraph provides introductory information and contains no specific requirements. Discussion is provided in subsequent sub-sections.

Reference Document

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.1.1 Safe Shutdown Paths For BWRs	[BWR] GE Report GE-NE-T43-00002-00-01-R01 entitled "Original Safe Shutdown Paths For The BWR" addresses the systems and equipment originally designed into the GE boiling water reactors (BWRs) in the 1960s and 1970s, that can be used to achieve and maintain safe shutdown per Section III.G.1 of 10CFR 50, Appendix R. Any of the shutdown paths (methods) described in this report are considered to be acceptable methods for achieving redundant safe shutdown.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The primary means of achieving and maintaining hot shutdown following a fire coincident with a Loss of Offsite Power (LOOP) is via the Emergency Condenser (EC) system. The EC system consists of two redundant emergency cooling loops; each loop is capable of independently accomplishing hot shutdown. Therefore, this option provides two redundant paths for obtaining hot shutdown.

The EC system operates by natural circulation. Steam flows from the vessel through the EC tubes. Condensate returns to the vessel through a reactor recirculation loop. Boiling of water in the secondary side of the ECs, which is vented to the atmosphere, provides the necessary cooling.

In the event the preferred shutdown method is not available, the plant can be shut down by opening three Electromatic Relief Valves (ERVs) and discharging steam to the Torus to reduce pressure. When reactor pressure reaches approximately 365psig, Core Spray (CS) may be initiated. CS is a two loop system. Operation of one LOOP is adequate to achieve shutdown. Eventually, the reactor vessel floods to the point where the ERVs are passing fluid to the Torus rather than steam, in essence placing the Reactor Coolant System in recirculation through the Torus. During this process, decay heat is removed by operation of the Containment Spray System in conjunction with the Containment Spray Raw Water system. This shutdown method will bring the plant directly to CSD. Fully flooding the Reactor Pressure Vessel negates the need for another system to provide inventory makeup. AC power is required to initiate this shutdown method.

Reference Document

EIR 51-9133191, NSCA, Sections 5.1 and 5.2

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.1.2 SRVs and LPCI/CS	[BWR] GE Report GE-NE-T43-00002-00-03-R01 provides a discussion on the BWR Owners' Group (BWROG) position regarding the use of Safety Relief Valves (SRVs) and low pressure systems (LPCI/CS) for safe shutdown. The BWROG position is that the use of SRVs and low pressure systems is an acceptable methodology for achieving redundant safe shutdown in accordance with the requirements of 10 CFR 50 Appendix R Sections III.G.1 and III.G.2. The NRC has accepted the BWROG position and issued an SER dated Dec. 12, 2000.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

For NMP1, using the Electromatic Relief Valves (ERVs) to remove decay heat to the torus and low pressure Core Spray system is an acceptable method for achieving safe shutdown. The Emergency Condensers provide one shutdown flow path while the ERVs provide an Alternate Shutdown method.

Reference Document

EIR 51-9133191, NSCA, Section 4.0
NMP1 Safety Evaluation 84-18, ADS Logic Modification

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.1.3 Pressurizer Heaters	[PWR] Generic Letter 86-10, Enclosure 2, Section 5.3.5 specifies that hot shutdown can be maintained without the use of pressurizer heaters (i.e., pressure control is provided by controlling the makeup/charging pumps). Hot shutdown conditions can be maintained via natural circulation of the RCS through the steam generators. The cooldown rate must be controlled to prevent the formation of a bubble in the reactor head. Therefore, feedwater (either auxiliary or emergency) flow rates as well as steam release must be controlled.

Applicability	Comments
Not Applicable	NMP1 is a BWR plant.

Alignment Statement

Not Required

Alignment Basis

NMP1 is a BWR plant.

Reference Document

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.1.4 Alternative Shutdown Classification	The classification of shutdown capability as alternative/dedicated shutdown is made independent of the selection of systems used for shutdown. Alternative/dedicated shutdown capability is determined based on an inability to assure the availability of a redundant safe shutdown path. Compliance to the separation requirements of Sections III.G.1 and III.G.2 may be supplemented by the use of operator manual actions to the extent allowed by the regulations and the licensing basis of the plant (see Appendix E), repairs (cold shutdown only), exemptions, deviations, GL 86-10 fire hazards analyses or fire protection design change evaluations permitted by GL 86-10, as appropriate. These may also be used in conjunction with alternative/dedicated shutdown capability. A discussion of time zero for the fire condition, as it relates to operator manual actions and repairs, is contained in Appendix E.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The criteria of 10CFR50 Appendix R, Section III.G.3, requires alternate or dedicated shutdown capability for all plant areas where the protection of systems for hot shutdown does not satisfy the requirements of Sections III.G.1 and III.G.2 of Appendix R. The hot shutdown system to be used for a control room evacuation event is the EC system.

NMP1 has two Remote Shutdown Panels installed for the purpose of monitoring the Plant Shutdown in the event of a Control Room evacuation. Modifications were performed which hardened the EC system from spurious isolations due to the effects of a control complex fire. Upon receiving either a high reactor pressure signal or a low-low reactor water level signal, the ECs will automatically initiate, independent of the control complex, due to the shutdown supervisory control system redundant initiation logic located in the reactor building, although Operator action will initiate the safe shutdown systems prior to its automatic initiation to conserve reactor vessel inventory.

Reference Document

EIR 51-9133191, NSCA, Section 2.1.1
NMP1 Safety Evaluation 83-29, Emergency Condensers

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.1.5 Operable and Available	At the onset of the postulated fire, all safe shutdown systems (including applicable redundant trains) are assumed operable and available for post-fire safe shutdown. Systems are assumed to be operational with no repairs, maintenance, testing, Limiting Conditions for Operation, etc. in progress. The units are assumed to be operating at full power under normal conditions and normal lineups.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

As stated in the Fire Area Assessments at the onset of the fire, all systems not affected by the fire are considered to be available and capable of functioning as designed. All safe shutdown systems (including redundant trains) are assumed to be operational and available for post-fire safe shutdown. Systems are assumed to be operational with no repairs, maintenance, testing, Limiting Conditions for Operation, etc. The unit is assumed to be operating at full power under normal conditions and normal lineups.

Reference Document

EIR 51-9133191, NSCA, Section 4.0

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.1.6 No concurrent DBAs	No Final Safety Analysis Report accidents or other design basis events (e.g. loss of coolant accident, earthquake), single failures or nonfire induced transients need be considered in conjunction with the fire.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

No accidents or other design basis events (e.g. loss of coolant accident, earthquake), single failures or non-fire induced transients are considered in conjunction with the fire.

The fire does not occur simultaneously or coincident with any other transient or abnormal condition, except for loss of offsite power (LOOP) and those conditions resulting directly from the effects of a fire. No credit is taken for offsite power availability; however, offsite power is considered to be available if the fire effects produce more conservative results.

Reference Document

EIR 51-9133191, NSCA, Section 9.0

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.1.7 Offsite Power Availability	For the case of redundant shutdown, offsite power may be credited if demonstrated to be free of fire damage. Offsite power should be assumed to remain available for those cases where its availability may adversely impact safety (i.e., reliance cannot be placed on fire causing a loss of offsite power if the consequences of offsite power availability are more severe than its presumed loss). No credit should be taken for a fire causing a loss of offsite power. For areas where train separation cannot be achieved and alternative shutdown capability is necessary, shutdown must be demonstrated both where offsite power is available and where offsite power is not available for 72 hours.

Applicability	Comments
Applicable	ONS RAI 3-40 is addressed; No credit is taken for offsite power.

Alignment Statement

Aligns

Alignment Basis

For redundant safe shutdown, offsite power is presumed lost. However, offsite~~Offsite~~ power is assumed to remain available for those cases where its availability may adversely impact safety (i.e., reliance cannot be placed on fire causing a loss of offsite power if the consequences of offsite power availability are more severe than its presumed loss). No credit is taken for a fire causing a loss of offsite power. For areas where train separation cannot be achieved and alternative shutdown capability is necessary, shutdown is demonstrated both where offsite power is available and where offsite power is not available (NFPA 805 requires maintaining the fuel in a safe and stable condition, i.e., there is no requirement to achieve and maintain CSD, and therefore no 72-hour coping time requirement). ~~for 72 hours.~~ Offsite power has not been specifically analyzed. There are no fire areas where offsite power is credited.

Reference Document

EIR 51-9133191, NSCA, Section 9.0
ONS RAI 3-40, NRC Request for Additional Information dated July 30, 2010 (ML102110394)
Closure of National Fire Protection Association 805 Transition Program Frequently Asked Question Number 08-0054 (ML110140183)

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.1.8 Safety Related Classification	Post-fire safe shutdown systems and components are not required to be safety-related.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Credited safe shutdown systems and components are not always safety related. Most components are safety related due to their emergency functions, but they are not required to be safety-related.

Reference Document

EIR 51-9133191, NSCA, Section 4.0

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.1.9 72-hour Coping Period	The post-fire safe shutdown analysis assumes a 72-hour coping period starting with a reactor scram/trip. Fire-induced impacts that provide no adverse consequences to hot shutdown within this 72-hour period need not be included in the post-fire safe shutdown analysis. At least one train can be repaired or made operable within 72 hours using onsite capability to achieve cold shutdown.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Appendix R requires cold shutdown of the reactor within 72 hours for fire events, with or without offsite power available. The original NMP1 ~~The~~ Safe Shutdown Analysis identifies the safe shutdown systems and components which are powered by on-site sources, where at least one train can be repaired or made operable within the 72 hours. However, NFPA 805 does not require a 72-hour coping period. Rather, the requirement is to maintain the fuel in a safe and stable condition (i.e., there is neither a requirement nor timeframe to reach and maintain cold shutdown). Refer to Section 4.2.1.2 for a description of safe and stable as applied to NMP1. NMP1 demonstrates the ability to maintain for ~~This is accomplished for~~ each fire area the fuel in a safe and stable condition with one of four designated shutdown paths.~~cold shutdown trains.~~ Offsite power is not credited with providing any power or beneficial effects.~~shutdown methods during the 72 hours, thereby meeting this requirement.~~

Shutdown Paths:~~Cold Shutdown Options:~~

A.- Train 11 ~~-~~ – Emergency cooling, ~~Shutdown cooling, RBCLC, ESW,~~ CRD system (makeup).

B. Train 12 ~~-~~ – Emergency cooling, ~~Shutdown cooling, RBCLC, ESW,~~ CRD system (makeup).

C. Train 11 - ERVs, core spray, containment spray, containment spray raw water.

D. Train 12 - ERVs, core spray, containment spray, containment spray raw water.

Note: As part of the NMP1 defense-in-depth approach to fire protection, provisions have been made for permanent installation of a feedwater/fire protection water spool piece, which will provide an emergency makeup source from the diesel fire pump for cold shutdown inventory control.

~~Shutdown Cooling with LOOP (Options A and B)~~

~~The primary means for achieving and maintaining cold shutdown following a fire coincident with a LOOP is via the shutdown cooling system. The shutdown cooling system, supported by the RBCLC and the ESW systems, removes decay heat from the reactor vessel to the UHS. Emergency AC power (onsite DGs) is required for this mode of cold shutdown.~~

Reference Document

EIR 51-9133191, NSCA, Section 4.0 and 5.0
HNP RAI 3-7 and RAI 3.8, NRC Request for Additional Information dated August 6, 2009 (ML092170715)
Closure of National Fire Protection Association 805 Transition Program Frequently Asked Question Number 08-0054 (ML110140183)

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.1.10 Manual Initiation of Systems	Manual initiation from the main control room or emergency control stations of systems required to achieve and maintain safe shutdown is acceptable where permitted by current regulations or approved by NRC (See Appendix E); automatic initiation of systems selected for safe shutdown is not required but may be included as an option, if the additional cables and equipment are also included in the analysis. Spurious actuation of automatic systems (Safety Injection, Auxiliary Feedwater, High Pressure Coolant Injection, Reactor Core Isolation Cooling, etc.) due to fire damage, however, should be evaluated.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Manual initiation of safe shutdown related equipment from either the control room, emergency control stations or approved locations other than the primary control stations is an acceptable means for compliance based on the current regulations. The safe shutdown performance and design requirements for the reactivity control function can be met without automatic scram capability. The post-fire safe shutdown analysis need only provide the capability to manually scram the reactor. Automatic functions of components have been included for selected systems. Impacts due to spurious actuation of automatic systems are included in the evaluation of the analysis.

Reference Document

EIR 51-9133191, NSCA, Sections 4.0, 5.1, 5.2, and 5.4

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.1.11 Multi-unit Plant	Where a single fire can impact more than one unit of a multi-unit plant, the ability to achieve and maintain safe shutdown for each affected unit must be demonstrated.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

As stated in the UFSAR, simultaneous fires affecting NMP1 and NMP2 are not anticipated, due to the spatial separation between the two units and the designed separation (fire barrier) at facility interfaces. NMP1 and NMP2 do not share common facilities for the support of reactor operation or generation of electricity. However, there is the capability to cross-tie the firewater system between NMP1 and NMP2 via ~~manual~~ cross-tie valves.

Reference Document

UFSAR, Appendix 10A, Section 2.1.9

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.2 Shutdown Functions	The following discussion on each of these shutdown functions provides guidance for selecting the systems and equipment required for hot shutdown. For additional information on BWR system selection, refer to GE Report GENE-T43-00002-00-01-R01 entitled "Original Safe Shutdown Paths for the BWR."

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

This paragraph provides introductory information and contains no specific requirements. Discussion is provided in subsequent sub-sections.

Reference Document

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.2.1 Reactivity Control	[BWR] Control Rod Drive System The safe shutdown performance and design requirements for the reactivity control function can be met without automatic scram/trip capability. Manual scram/reactor trip is credited. The post-fire safe shutdown analysis must only provide the capability to manually scram/trip the reactor. Each licensee should have an operator manual action to either vent the instrument air header or to remove RPS power in their post-fire safe shutdown procedures. The presence of this action precludes the need to perform circuit analysis for the reactivity control function and is an acceptable way to accomplish this function. If this action is a "time critical" action, the timing must be justified. [PWR] Makeup/Charging There must be a method for ensuring that adequate shutdown margin is maintained from initial reactor SCRAM to cold shutdown conditions, by controlling Reactor Coolant System temperature and ensuring borated water is utilized for RCS makeup/charging.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns With Intent

Alignment Basis

As documented in the current NMP1 Safe Shutdown Analysis, the reactivity control function is capable of achieving and maintaining cold shutdown reactivity conditions. The safe shutdown performance and design requirements for the reactivity control function can be met without automatic scram capability. The post-fire safe shutdown analysis provides the capability to manually scram the reactor. Manual reactor scram is accomplished via the scram valves. Plant operators can manually scram the plant from the control room or the remote shutdown panel. The capability to manually scram/trip the reactor is provided in NMP1 Special Operating Procedures N1-SOP-21.1, Fire in Plant, and N1-SOP-21.2, Control Room Evacuation, with reference to the Emergency Operating Procedures for operators to manually vent the instrument air header or to remove RPS power. This action is not considered a "time critical" action because the Mode switch is placed in shutdown and all control rods inserted prior to evacuating the control room. Also, NMP1 complies with the position in BWROG document BWROG-TP-11-011 entitled "BWROG Assessment of Generic Multiple Spurious Operations (MSOs) in Post-Fire Safe Shutdown Circuit Analysis for the Operation of BWR Plants" for manual scram; thereby, supporting that this is not a time critical action.

Reference Document

EIR 51-9133191, NSCA, Sections 4.0 and 5.3
NMP1 Emergency Operating Procedure N1-EOP-2, RPV Control
NMP1 Emergency Operating Procedure 3, Failure to Scram
NMP1 Emergency Operating Procedure 3.1, Alternate Control Rod Insertion
NMP1 Special Operating Procedure, N1-SOP-21.2, Control Room Evacuation, pg. 3
NMP1 Special Operating Procedure, N1-SOP-21.1, Fire in Plant, pg. 2

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.2.2 Pressure Control Systems	The systems discussed in this section are examples of systems that can be used for pressure control. This does not restrict the use of other systems for this purpose. [BWR] Safety Relief Valves (SRVs) Initial pressure control may be provided by the SRVs mechanically cycling at their setpoints (electrically cycling for EMRVs). Mechanically-actuated SRVs require no electrical analysis to perform their overpressure protection function. The SRVs may also be opened to maintain hot shutdown conditions or to depressurize the vessel to allow injection using low pressure systems. These are operated manually. Automatic initiation of the Automatic Depressurization System (ADS) is not a required function. Automatic initiation of the ADS may be credited, if available. If automatic ADS is not available and use of ADS is desired, an alternative means of initiation of ADS separate from the automatic initiation logic for accomplishing the pressure control function should be provided. [PWR] Makeup/Charging RCS pressure is controlled by controlling the rate of charging/makeup to the RCS. Although utilization of the pressurizer heaters and/or auxiliary spray reduces operator burden, neither component is required to provide adequate pressure control. Pressure reductions are made by allowing the RCS to cool/shrink, thus reducing pressurizer level/pressure. Pressure increases are made by initiating charging/makeup to maintain pressurizer level/pressure. Manual control of the related pumps is acceptable.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The pressure control function is capable of safely reducing reactor vessel pressure.

For the preferred shutdown method, pressure control is achieved through control of the cooldown rate of the emergency condensers. The Electromatic Relief Valves (ERVs) are maintained closed.

In the event the preferred shutdown method is not available, the plant can be shut down by opening three ERVs and discharging steam to the Torus to reduce pressure. For this secondary method, the ERVs are opened manually to depressurize the vessel to allow injection using low pressure systems. Automatic initiation of the ADS is not a required function.

Reference Document

EIR 51-9133191, NSCA, Sections 4.0, 5.1, 5.2, and 5.3

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.2.3 Inventory Control	[BWR] Systems selected for the inventory control function should be capable of supplying sufficient reactor coolant to achieve and maintain hot shutdown. Manual initiation of these systems is acceptable. Automatic initiation functions are not required. Spurious actuation of automatic systems, however, should be evaluated (High Pressure Coolant Injection, High Pressure Core Spray, Reactor Core Isolation Cooling, etc.). [PWR]: Systems selected for the inventory control function should be capable of maintaining level to achieve and maintain hot shutdown. Typically, the same components providing inventory control are capable of providing pressure control. Manual initiation of these systems is acceptable. Automatic initiation functions are not required. Spurious actuation of automatic systems, however, should be evaluated (Safety Injection, High Pressure Injection, Auxiliary Feedwater, Emergency Feedwater, etc.).

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

For the preferred hot shutdown method, reactor vessel make-up is required 8 hours after operation of the Emergency Condensers (EC) ensues. A Control Rod Drive pump is used to provide vessel make-up. The inventory makeup provided by the CRD pump is also used ~~part of cold shutdown~~ to raise the Reactor water level at such time that ~~and make~~ the shutdown cooling system is placed in service.~~more effective. Restoration of the CRD pump is via repair actions to secure power sources, etc.~~

NMP1 has a defense-in-depth inventory control approach for fire protection by using the firewater to feedwater connection in accordance with NMP1 operating procedures, which provides an emergency makeup source from the diesel fire pump for ~~cold~~ shutdown inventory control.

As a secondary method, the vessel can be flooded by the Core Spray system after depressurization. This fulfills the vessel inventory make-up by default.

Spurious Actuations are addressed specifically in the Fire Area Assessments. They are considered to exist from the onset of the fire and for the duration of the shutdown process.

Reference Document

EIR 51-9133191, NSCA, Sections 5.3 and 8.6

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref

3.1.2.4 Decay Heat Removal

NEI 00-01 Guidance

[BWR] Systems selected for the decay heat removal function(s) should be capable of:

- Removing sufficient decay heat from primary containment, to prevent containment over-pressurization and failure.
- Satisfying the net positive suction head requirements of any safe shutdown systems taking suction from the containment (suppression pool).
- Removing sufficient decay heat from the reactor to achieve cold shutdown. (This is not a hot shutdown requirement).

[PWR] Systems selected for the decay heat removal function(s) should be capable of:

- Removing sufficient decay heat from the reactor to reach hot shutdown conditions. Typically, this entails utilizing natural circulation in lieu of forced circulation via the reactor coolant pumps and controlling steam release via the Atmospheric Dump valves.
- Removing sufficient decay heat from the reactor to reach cold shutdown conditions. (This is not a hot shutdown requirement).

This does not restrict the use of other systems.

Applicability

Applicable

Comments

None

Alignment Statement

Aligns

Alignment Basis

The decay heat removal function is capable of achieving and maintaining safe and stable conditions.~~hot and cold shutdown.~~ The EC system operates by natural circulation where steam flows upward to the condenser(s) and returns as condensate to the Reactor Pressure Vessel. Decay heat is removed through the transfer of heat from the reactor coolant to the shell side water of the EC which vents the developed steam to atmosphere. Operation of either EC loop can sustain Hot Shutdown conditions for 8 hours without the need for makeup from the Condensate Storage Tank or Fire Water System. The decay heat removal process also reduces reactor pressure. When reactor pressure is reduced to 120 psig and reactor temperature is reduced to 350 degrees F, the plant can be transitioned to ~~Cold Shutdown by initiating~~ shutdown cooling. The EC system can be used to maintain Hot Shutdown conditions for an extended period of time by using the diesel fire pump to refill the Emergency Condensers as needed. The diesel fire pump draws water from Lake Ontario (essentially an infinite source) and need only be refueled periodically to maintain this method of decay heat removal. Note that Emergency Condenser level monitoring is a credited function.

In the event the preferred shutdown method is not available, the plant can be shut down by opening three ERVs and discharging steam to the Torus to reduce pressure. When reactor pressure reaches approximately 365 psig, Core Spray (CS) may be initiated. CS is a two loop system. Operation of one loop is adequate to achieve shutdown. Eventually, the reactor vessel floods to the point where the ERVs are passing fluid to the Torus rather than steam, in essence placing the Reactor Coolant System in recirculation through the Torus. During this process, decay heat is removed by operation of the Containment Spray System in conjunction with the Containment Spray Raw Water system. Containment spray and containment spray raw water systems are utilized to remove heat from the torus water and maintain it within the core spray and containment spray pumps' net positive suction head (NPSH) requirements. This shutdown method will bring the plant directly to cold shutdown. Fully flooding the Reactor Pressure Vessel negates the need for another system to provide inventory makeup. AC power is required to initiate this shutdown method.

Reference Document

EIR 51-9133191, NSCA, Sections 4.0 and 5.1

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.2.5 Process Monitoring	The process monitoring function is provided for all safe shutdown paths. IN 84-09, Attachment 1, Section IX "Lessons Learned from NRC Inspections of Fire Protection Safe Shutdown Systems (10 CFR 50 Appendix R)" provides guidance on the instrumentation acceptable to and preferred by the NRC for meeting the process monitoring function. This instrumentation is that which monitors the process variables necessary to perform and control the functions specified in Appendix R Section III.L.1. Such instrumentation must be demonstrated to remain unaffected by the fire. The IN 84-09 list of process monitoring is applied to alternative/dedicated shutdown (III.G.3). The use of this same list for III.G.2 redundant Post-Fire Safe Shutdown is acceptable, but the analyst needs to review the specific license basis for the plant under evaluation. In general, process monitoring instruments similar to those listed below are needed to successfully use existing operating procedures (including Abnormal Operating Procedures). BWR ▪ Reactor coolant level and pressure ▪ Suppression pool level and temperature ▪ Emergency or isolation condenser level ▪ Diagnostic instrumentation for safe shutdown systems ▪ Level indication for tanks needed for safe shutdown PWR ▪ Reactor coolant temperature (hot leg / cold leg) ▪ Pressurizer pressure and level ▪ Neutron flux monitoring (source range) ▪ Level indication for tanks needed for safe shutdown ▪ Steam generator level and pressure ▪ Diagnostic instrumentation for safe shutdown systems The specific instruments required may be based on operator preference, safe shutdown procedural guidance strategy (symptomatic vs. prescriptive), and systems and paths selected for safe shutdown.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The process monitoring function is to be provided for all safe shutdown paths. NEI 00-01 refers to NRC IN 84-09, Attachment 1, Section IX, as providing guidance on the instrumentation acceptable to and preferred by the NRC for meeting the process monitoring function. This instrumentation is that which monitors the process variables necessary to perform and control the functions specified in Appendix R Section III.L.1. Such instrumentation must be demonstrated to remain unaffected by the fire. The IN 84-09 list of process monitoring is applied to alternative shutdown (III.G.3). In general, process monitoring instruments similar to those listed below are needed to successfully use existing operating procedures related to post-fire shutdown (including Abnormal Operating Procedures).

-Reactor coolant level and pressure
-Suppression pool level and temperature
-Level indication for tanks needed for safe shutdown
-Diagnostic instrumentation for safe shutdown systems

The Reactor Protection System is utilized to satisfy the process monitoring objectives throughout hot and cold shutdown. The specific instruments required may be based on operator preference, safe shutdown procedural guidance strategy (symptomatic vs. prescriptive), and systems and paths selected for safe shutdown.

The following process monitoring functions are provided to support post-fire shutdown:

Primary and Secondary Methods

-Reactor coolant level
-Reactor coolant pressure
-Reactor coolant temperature
-Emergency Diesel Generator parameters

Primary Method

-Emergency Condenser level

Secondary Method

-Torus level
-Torus temperature
-Drywell pressure
-Drywell temperature
-Containment Spray water temperature
-Containment Spray pump discharge pressure

Reference Document

EIR 51-9133191, NSCA, Sections 4.0 and 5.3

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.2.6 Support Systems	Blank Heading - No Specific Guidance

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

Generic Heading: Alignment discussed in subsequent sub-sections.

Reference Document

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.2.6.1 Electrical Systems	AC Distribution System Power for the Appendix R safe shutdown equipment is typically provided by a medium voltage system such as 4.16 KV Class 1E busses either directly from the busses or through step down transformers/load centers/distribution panels for 600, 480 or 120 VAC loads. For redundant safe shutdown performed in accordance with the requirements of Appendix R Section III.G.1 and 2, power may be supplied from either offsite power sources or the emergency diesel generator depending on which has been demonstrated to be free of fire damage. No credit should be taken for any beneficial effects of a fire causing a loss of offsite power. Refer to Section 3.1.1.7. DC Distribution System Typically, the 125VDC distribution system supplies DC control power to various 125VDC control panels including switchgear breaker controls. The 125VDC distribution panels may also supply power to the 120VAC distribution panels via static inverters. These distribution panels may supply power for instrumentation necessary to complete the process monitoring functions. For fire events that result in an interruption of power to the AC electrical bus, the station batteries are necessary to supply any required control power during the interim time period required for the diesel generators to become operational. Once the diesels are operational, the 125VDC distribution system can be powered from sources feed from the diesels through the battery chargers. [BWR] Certain plants are also designed with a 250VDC Distribution System that supplies power to Reactor Core Isolation Cooling and/or High Pressure Coolant Injection equipment. The DC control centers may also supply power to various small horsepower Appendix R safe shutdown system valves and pumps. If the DC system is relied upon to support safe shutdown without battery chargers being available, it must be verified that sufficient battery capacity exists to support the necessary loads for sufficient time (either until power is restored, or the loads are no longer required to operate).
Applicability	**Comments**
Applicable	None

Alignment Statement

Aligns

Alignment Basis

No credit has been taken for the loss of offsite power, however in the event that offsite power is lost, NMP1 has two Emergency Diesel Generators (EDGs). The EDGs will supply the required medium and low voltage safe shutdown loads with AC power. The EDGs are designed to start automatically on loss of offsite power to re-energize emergency busses 102 and 103.
The 125V DC distribution panels supply power to the 120V AC distribution panels via static inverters. These distribution panels typically supply power for instrumentation necessary to complete process monitoring functions. The 125V DC distribution system supplies control power to various 125V DC control panels including switchgear breaker controls. Vital AC power can be provided via RPS uninterruptible power supplies (UPS) 162A, 162B, 172A and 172B.

This 125V DC distribution system is credited to support post fire safe shutdown. For fire events that result in an interruption of power to the AC electrical bus, the station batteries supply any required control power during the interim time period required for the EDGs to become operational. Once the EDGs are operational, the 125V DC distribution system can be powered from the diesels through the battery chargers.

Reference Document

EIR 51-9133191, NSCA, Sections 4.0 and 5.3

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.2.6.2 Cooling Systems	Various cooling water systems may be required to support safe shutdown system operation, based on plant-specific considerations. Typical uses include: ▪ RHR/SDC/DH Heat Exchanger cooling water ▪ Safe shutdown pump cooling (seal coolers, oil coolers) ▪ Diesel generator cooling

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Various cooling water systems are required to support safe shutdown system operation:

-The Reactor Building Closed Loop Cooling and Emergency Service Water Systems provide cooling to the control room ventilation system and Shutdown Cooling Heat Exchangers
-The EDGs are cooled by the EDG Raw Water pumps
-The Containment Spray and Containment Spray Raw Water Systems cool the torus for the secondary cooldown method
-The Chilled Water System is provided for control room ventilation

Reference Document

EIR 51-9133191, NSCA, Section 5.3

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref

3.1.2.6.3 HVAC Systems

NEI 00-01 Guidance

HVAC Systems may be required to assure that safe shutdown equipment remains within its operating temperature range, as specified in manufacturer's literature or demonstrated by suitable test methods, and to assure protection for plant operations staff from the effects of fire (smoke, heat, toxic gases, and gaseous fire suppression agents).

HVAC systems, however, are not required to support post-fire safe shutdown in all cases. The need for HVAC system operation is based on plant specific configurations and plant specific heat loads. Typical potential uses include:

- Main control room, cable spreading room, relay room
- ECCS pump compartments
- Diesel generator rooms
- Switchgear rooms

Plant specific evaluations are necessary to determine which HVAC systems could be required or useful in supporting post-fire safe shutdown. Transient temperature response analyses are often utilized to demonstrate that specific HVAC systems would or would not be required. If HVAC systems are credited, the potential for adverse fire effects to the HVAC system must also be considered, including:

- Dampers closing due to direct fire exposure or due to hot gases flowing through ventilation ducts from the fire area to an area not directly affected by the fire. Where provided, smoke dampers should consider similar effects from smoke.
- Recirculation or migration of toxic conditions (e.g., smoke from the fire, suppressants such as Carbon Dioxide).

In certain situations, adequate time exists to open doors to provide adequate cooling to allow continued equipment operation. Therefore, the list of required safe shutdown components as it relates to HVAC Systems may be determined based on transient temperature analysis. Should this analysis demonstrate that adequate time exists to open doors to provide the necessary cooling, this is an acceptable approach to achieving HVAC Cooling. The temperature analysis must demonstrate the adequacy of the cooling effect from opening the door within the specified time. Only those components whose operation is required to provide HVAC Cooling for required safe shutdown components in a time frame that cannot be justified for operator manual actions are considered themselves to be required safe shutdown components. This latter set of HVAC Cooling Components are required to meet the criteria for required safe shutdown components with regard to the available mitigating tools.

Applicability

Applicable

Comments

None

Alignment Statement

Aligns

Alignment Basis

HVAC Systems required to support post-fire shutdown are:

-Main control room ventilation (except for control room evacuation)
-EDG rooms (fans and roll-up doors)

Paths developed for the control room ventilation system do not necessarily match the paths for process systems. Paths for the ventilation system are as follows:

-Path A – Recirculation flow path
-Path B – Smoke purge flow path

-Path C – Train 11 positive pressure flow path.
-Path D – Train 12 positive pressure flow path

Given the failure modes of dampers and EDG power requirement, Paths C & D are generally credited for post-fire shutdown. Any ventilation path can be supported by Train 11 or Train 12 Chilled Water.

Reference Document

EIR 51-9133191, NSCA, Section 5.3

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.3 Methodology For Shutdown System Collection	Refer to Figure 3-2 for a flowchart illustrating the various steps involved in selecting safe shutdown systems and developing the shutdown paths. The following methodology may be used to define the safe shutdown systems and paths for an Appendix R analysis:

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

This paragraph provides introductory information and contains no specific requirements. Discussion is provided in subsequent sub-sections.

Reference Document

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.3.1 Identify Safe Shutdown Functions	Review available documentation to obtain an understanding of the available plant systems and the functions required to achieve and maintain safe shutdown. Documents such as the following may be reviewed: ▪ Operating Procedures (Normal, Emergency, Abnormal) ▪ System descriptions ▪ Fire Hazard Analysis ▪ Single-line electrical diagrams ▪ Piping and Instrumentation Diagrams (P&IDs) ▪ [BWR] GE Report GE-NE-T43-00002-00-01-R02 entitled "Original Shutdown Paths for the BWR"

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Safe shutdown systems and functions required to satisfy the safe shutdown performance goals were developed and identified from available plant documentation. This documentation includes but is not limited to electrical one line diagrams, schematics, piping and instrumentation diagrams (P&IDs), operating procedures, UFSAR, Fire Hazards Analysis, and the systems descriptions.

Reference Document

EIR 51-9133191, NSCA, Section 5.4

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.3.2 Identify Combinations of Systems That Satisfy Each Safe Shutdown Function	Given the criteria/assumptions defined in Section 3.1.1, identify the available combinations of systems capable of achieving the safe shutdown functions of reactivity control, pressure control, inventory control, decay heat removal, process monitoring and support systems such as electrical and cooling systems (refer to Section 3.1.2). This selection process does not restrict the use of other systems. In addition to achieving the required safe shutdown functions, consider other equipment whose mal-operation or spurious operation could impact the required safe shutdown function. The components in this latter set are classified as either required for hot shutdown or as important to SSD as explained in Appendix H.

Applicability	Comments
Applicable	

Alignment Statement

Aligns

Alignment Basis

Safe shutdown systems, components, and cables were selected using the criteria and assumptions of NEI 00-01, Sections 3.1.1 and 3.1.2 to satisfy each safe shutdown function performance goal, including process monitoring and support systems. NEI 00-01 was used as the guidance in developing the Safe Shutdown Equipment List and the Safe Shutdown success paths.

The following combination of systems are capable of achieving safe shutdown functions.

1) Reactivity Control – Control Rod Drive System

The safe shutdown performance and design requirements for the reactivity control function can be met without automatic scram capability. The post-fire safe shutdown analysis need only provide the capability to manually scram the reactor.

2) Pressure Control Systems - ERVs

The ERVs are opened to maintain hot shutdown conditions or to depressurize the vessel to allow injection using low pressure systems. These are operated manually. Automatic initiation of the ADS is not a required function.

3) Inventory Control

Systems selected for the inventory control function are capable of supplying sufficient reactor coolant to maintain the fuel in a safe and stable condition.~~achieve and maintain hot shutdown.~~ Manual initiation of these systems is acceptable. Automatic initiation functions are not required.

4) Decay Heat Removal

Systems selected for the decay heat removal function(s) are capable of:

- Removing sufficient decay heat from primary containment to prevent containment over-pressurization and failure.
- Satisfying the net positive suction head requirements of any safe shutdown systems taking suction from the torus.
- Removing sufficient decay heat from the reactor to maintain the fuel in a safe and stable condition.~~achieve cold shutdown.~~

5) Process Monitoring

The process monitoring function is to be provided for all safe shutdown paths. NEI 00-01 refers to NRC IN 84-09, Attachment 1, Section IX, as providing guidance on the instrumentation acceptable to and preferred by the NRC for meeting the process monitoring function. This instrumentation is that which monitors the process variables necessary to perform and control the functions specified in Appendix R Section III.L.1. Such instrumentation must be demonstrated to remain unaffected by the fire. The IN 84-09 list of process monitoring functions is applied to alternative shutdown (III.G.3). In general, process monitoring instruments similar to those listed below are needed to successfully use existing operating procedures related to post-fire shutdown (including Abnormal Operating Procedures).

- Reactor coolant level and pressure
- Torus level and temperature
- Level indication for tanks needed for safe shutdown
- Diagnostic instrumentation for safe shutdown systems

The specific instruments required may be based on operator preference, safe shutdown procedural guidance strategy (symptomatic vs. prescriptive), and systems and paths selected for safe shutdown.

Note – For NMP1, Emergency Condenser level is a required process monitoring function.

6) Support Systems

A. Electrical Systems

AC Distribution System

Power for safe shutdown equipment is supplied from either offsite power sources or the emergency diesel generator. No credit is taken for a fire causing a loss of offsite power.

DC Distribution System

The 125V DC distribution system supplies control power to various 125V DC control panels including switchgear breaker controls. The 125V DC distribution panels also supply power to the 120V AC distribution panels via static inverters. These distribution panels supply power for instrumentation necessary to complete process monitoring functions. For fire events that result in an interruption of power to the AC electrical bus, the station batteries are necessary to supply any required control power during the interim time period required for the diesel generators to become operational. Once the diesels are operational, the 125V DC distribution systems can be powered from the diesels through the battery chargers.

B . Cooling Systems

Various cooling water systems are required to support safe shutdown system operation, based on plant-specific considerations. Cooling system uses include:

- SDC Heat Exchanger cooling water
- Safe shutdown pump cooling (seal coolers, oil coolers)
- Diesel generator cooling
- HVAC system cooling water

C. HVAC Systems

HVAC Systems are required to assure that safe shutdown equipment remains within its operating temperature range, as specified in manufacturer's literature or demonstrated by suitable test methods, and to assure protection for plant operations staff from the effects of fire (smoke, heat, toxic gases, and gaseous fire suppression agents).

HVAC uses include:

- Main control room, cable spreading room, relay room
- ECCS pump compartments
- Diesel generator rooms
- Switchgear Rooms

Paths developed for the control room ventilation system do not necessarily match the paths for process systems. Paths for the ventilation system are as follows:

-Path A – Recirculation flow path
-Path B – Smoke purge flow path
-Path C – Train 11 positive pressure flow path.
-Path D – Train 12 positive pressure flow path

Given the failure modes of dampers and EDG power requirement, Paths C & D are generally credited for post-fire shutdown. Any ventilation path can be supported by Train 11 or Train 12 Chilled Water.

Reference Document

EIR 51-9133191, NSCA, Sections 4.0, 5.0, and 5.4

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.3.3 Define Combination of Systems for Each Safe Shutdown Path	Select combinations of systems with the capability of performing all of the required safe shutdown functions and designate this set of systems as a safe shutdown path. In many cases, paths may be defined on a divisional basis since the availability of electrical power and other support systems must be demonstrated for each path. During the equipment selection phase, identify any additional support systems and list them for the appropriate path.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Safe shutdown systems, components, and cables were selected using the criteria and assumptions of NEI 00-01, Sections 3.1.1 and 3.1.2 to satisfy each safe shutdown function performance goal, including process monitoring and support systems for each path. NEI 00-01 was used as the guidance in developing the Safe Shutdown Equipment List and the Safe Shutdown success paths. The shutdown paths and equipment selection for the shutdown performance goals are identified in the NSCA.

Reference Document

EIR 51-9133191, NSCA, Sections 4.0 and 5.0

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.1.3.4 Assign Shutdown Paths to Each Combination of Systems	Assign a path designation to each combination of systems. The path will serve to document the combination of systems relied upon for safe shutdown in each fire area. Refer to Attachment 1 to this document for an example of a table illustrating how to document the various combinations of systems for selected shutdown paths.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Safe shutdown systems, components, and cables were selected using the criteria and assumptions of NEI 00-01, Sections 3.1.1 and 3.1.2 to satisfy each safe shutdown function performance goal, including process monitoring and support systems for each path. NEI 00-01 was used as the guidance in developing the Safe Shutdown Equipment List and the Safe Shutdown success paths. Safe Shutdown Paths were designed based on the combination of systems in the respective fire area.

The major systems for safe shutdown success paths are as follows:

- SUCCESS PATH "A"

Hot shutdown is achieved via the use of ECs 111 & 112 for Decay Heat Removal. The DFP is used as an inventory source for the EC system. ~~Cold shutdown is accomplished via the use of Train 11 SDC System components supported by the Train 11 RBCLC and ESW Systems.~~ The Train 11 CRD pump or the DFP is used for inventory control/RPV makeup. Path A is generally supported by the Train 11 AC and DC power systems. Some components in Path A systems are powered by the Train 12 AC and/or DC power system while other components may require local operator action due to a potential loss of instrument air.

- SUCCESS PATH "B"

Hot shutdown is achieved via the use of ECs 121 & 122 for Decay Heat Removal. The DFP is used as an inventory source for the EC system.~~Cold shutdown is accomplished via the use of Train 12 SDC System components supported by the Train 12 RBCLC and ESW Systems.~~ The Train 12 CRD pump or the DFP is used for inventory control/RPV makeup. Path B is generally supported by the Train 12 AC and DC power systems. Some components in Path B systems are powered by the Train 11 AC and/or DC power system while other components may require local operator action due to a potential loss of instrument air.

- SUCCESS PATH "C"

~~Both hot shutdown and cold shutdown are~~Hot shutdown is achieved via use of the Train 11 ERVs (PSV-01-102A, PSV-01-102B, PSV-01-102E) to depressurize the reactor. When pressure drops to the appropriate level, the CS System is used to flood the vessel and place the RCS in a recirculation mode to the Torus. Torus cooling is provided by the CTS system supported by the CTSRW System. These systems can be ~~are~~ maintained in service to directly achieve cold shutdown conditions. Path C is generally supported by the Train 11 AC and DC power systems. Some components in Path C systems are powered by the Train 12 AC and/or DC power system.

- SUCCESS PATH "D"

Hot shutdown is ~~Both hot shutdown and cold shutdown are~~ achieved via use of the Train 12 ERVs (PSV-01-102C, PSV-01-102D, PSV-01-102F) to depressurize the reactor. When pressure drops to the appropriate level, the CS System is used to flood the vessel and place the RCS in a recirculation mode to the Torus. Torus cooling is provided by the CTS System supported by the CTSRW System. These systems can be ~~are~~ maintained in service to directly achieve cold shutdown conditions. Path D is generally supported by the Train 12 AC and DC power systems. Some components in Path D systems are powered by the Train 11 AC and/or DC power system.

Path A and Path B are the preferred shutdown paths to maintain the fuel in a safe and stable condition ~~for both hot shutdown and cold shutdown~~ as these paths present the least thermal hydraulic impact to the plant.

It is possible that for some fire areas, one Path may be employed for hot shutdown and another for cold shutdown. This depends upon the impacts to power supplies and other components in any particular fire area, the controls design of credited components and the use of damage repair procedures. Consequently, it is possible that Path B may be credited for hot shutdown and Path D for cold shutdown, or any other combination. However, if Path C or D is credited for hot shutdown, that path would also be credited for cold shutdown due to the dynamics of the shutdown process.

Reference Document

EIR 51-9133191, NSCA, Section 5.3
Closure of National Fire Protection Association 805 Transition Program Frequently Asked Question Number 08-0054 (ML110140183)

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.2 Safe Shutdown Equipment Selection	The previous section described the methodology for selecting the systems and paths necessary to achieve and maintain safe shutdown for an exposure fire event (see Section 5.0 DEFINITIONS for "Exposure Fire"). This section describes the criteria/assumptions and selection methodology for identifying the specific safe shutdown equipment necessary for the systems to perform their Appendix R functions. The selected equipment should be related back to the safe shutdown systems that they support and be assigned to the same safe shutdown path as that system. The list of safe shutdown equipment will then form the basis for identifying the cables necessary for the operation or that can cause the mal-operation of the safe shutdown systems. For each path it will be important to understand which components are classified as required safe shutdown components and which are classified as important to safe shutdown components. When evaluating the fire-induced impact to each affected cable/component in each fire area, this classification dictates the tools available for mitigation the affects.

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

This paragraph provides introductory information and contains no specific requirements. Discussion is provided in subsequent sub-sections.

Reference Document

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.2.1 Criteria/Assumptions	Consider the following criteria and assumptions when identifying equipment necessary to perform the required safe shutdown functions:

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

This paragraph provides introductory information and contains no specific requirements. Discussion is provided in subsequent sub-sections.

Reference Document

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.2.1.1 Safe Shutdown Equipment Categories	Safe shutdown equipment can be divided into two categories. Equipment may be categorized as (1) primary components or (2) secondary components. Typically, the following types of equipment are considered to be primary components: ▪ Pumps, motor operated valves, solenoid valves, fans, gas bottles, dampers, unit coolers, etc. ▪ All necessary process indicators and recorders (i.e., flow indicator, temperature indicator, turbine speed indicator, pressure indicator, level recorder). ▪ Power supplies or other electrical components that support operation of primary components (i.e., diesel generators, switchgear, motor control centers, load centers, power supplies, distribution panels, etc.). Secondary components are typically items found within the circuitry for a primary component. These provide a supporting role to the overall circuit function. Some secondary components may provide an isolation function or a signal to a primary component via either an interlock or input signal processor. Examples of secondary components include flow switches, pressure switches, temperature switches, level switches, temperature elements, speed elements, transmitters, converters, controllers, transducers, signal conditioners, hand switches, relays, fuses and various instrumentation devices.
Applicability	**Comments**
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The Safe Shutdown Equipment List (SSEL) is a list of analyzed components that are utilized in the post-fire safe shutdown analysis to ensure that one success path (structures, systems, and components) necessary to achieve safe shutdown is free of fire damage without crediting plant or system repair.

The current NMP1 SSEL and Safe Shutdown Analysis was reviewed against the criteria outlined in NEI 00-01 (Sections 3.1 and 3.2) for safe shutdown systems and equipment selection. This review addressed potential fire induced circuit failure issues, either within or beyond the plant's existing licensing basis. Additional equipment has been included to address any multiple spurious operation concerns.

The SSEL is divided into primary and secondary components. Primary and secondary components were defined as being consistent with NEI 00-01 guidance. Equipment identified as primary components is included in the SSEL. Equipment identified as secondary components is included in the SSEL Database with the primary component(s) that would be affected by fire damage to the secondary component. By doing this, the SSEL is kept to a manageable size and the equipment included in the SSEL can be readily related to required post-fire safe shutdown systems and functions.

Secondary components were generally combined with primary components except where groups of secondary components were defined as "pseudo-components."

A "pseudo-component" is an artificial association of equipment and cables that perform a common function as a single entity for analysis purposes. The "pseudo-component" is assigned for analysis purposes only and is not an actual plant hardware designation. The concept of a "pseudo-component" was developed to account for those cables which constitute a circuit common to several components. The use of "pseudo-components" precludes the need to repeat cable selection and circuit analysis of these cables for each primary component. This generic name is interlocked with the affected primary components for analysis purposes and it inherits the attributes (path, system, train, etc.) of the components that it may affect. The nomenclature of the "pseudo-component" is similar to other equipment as defined in the plant equipment database.

Reference Document

EIR 51-9133191, NSCA, Section 5.4
EIR 51-9177678~~-000~~, Definitions Section

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.2.1.2 Manual Valves and Piping	Assume that exposure fire damage to manual valves and piping does not adversely impact their ability to perform their pressure boundary or safe shutdown function (heat sensitive piping materials, including tubing with brazed or soldered joints, are not included in this assumption). Fire damage should be evaluated with respect to the ability to manually open or close the valve should this be necessary as a part of the post-fire safe shutdown scenario. For example, post-fire coefficients of friction for rising stem valves cannot be readily determined. Handwheel sizes and rim pulls are based on well lubricated stems. Any post-fire operation of a rising stem valve should be well justified using an engineering evaluation.

Applicability	Comments
Applicable	Instrument tubing failure damage due to a fire is addressed in NSCA (EIR 51-9133191, Section 8.4).

Alignment Statement

Aligns With Intent

Alignment Basis

The NMP1 fire area assessments assume that an exposure fire does not adversely affect the ability of manual valves and piping to perform their pressure boundary or safe shutdown function. Fire damage to valves has been evaluated with respect to the ability to manually open or close the valve should this be necessary as a part of the post-fire safe shutdown scenario. Post-fire operation of manual valves within the affected fire area has been evaluated in the Fire Area Analysis.

Instrument sensing lines were reviewed for susceptibility to physical fire damage that may cause a loss of inventory. Sensing lines for SSEL components are constructed of either stainless steel or carbon steel. Consequently, they are not susceptible to physical damage as the result of a postulated fire.

Reference Document

EIR 51-9133191, NSCA, Sections 5.4 and 8.4
HNP RAI 3-15, NRC Request for Additional Information dated August 6, 2009 (ML092170715)

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.2.1.3 Valves in Normal Position	Assume that all components, including manual valves, are in their normal position as shown on P&IDs or in the plant operating procedures, that there are no LCOs in effect, that the Unit is operating at 100% power and that no equipment has been taken out of service for maintenance.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Manual valves are assumed to be in their normal operating position as shown on P&IDs or as identified in the plant operating procedures.

Comments

None

Reference Document

EIR 51-9133191, NSCA, Sections 5.4, 8.1, and 9.0

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.2.1.4 Check Valves	Assume that a check valve closes in the direction of potential flow diversion and seats properly with sufficient leak tightness to prevent flow diversion. Therefore, check valves do not adversely affect the flow rate capability of the safe shutdown systems being used for inventory control, decay heat removal, equipment cooling or other related safe shutdown functions.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Check valves are assumed to close in the direction of potential flow diversion and seat properly with sufficient leak tightness to prevent flow diversion or inventory loss. Check valves do not adversely affect flow rate capability of the safe shutdown systems.

Comments

None

Reference Document

EIR 51-9133191, NSCA, Section 5.4

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.2.1.5 Instrument Failure	Instruments (e.g., resistance temperature detectors, thermocouples, pressure transmitters, and flow transmitters) are assumed to fail upscale, midscale, or downscale as a result of fire damage, whichever is worse. An instrument performing a control function is assumed to provide an undesired signal to the control circuit.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Instruments are assumed to fail in the most undesirable worst state, whether upscale, downscale, or mid-scale. An instrument providing a control function is assumed to provide an undesired signal to the control circuit.

Comments

None

Reference Document

EIR 51-9133191, NSCA, Sections 5.4 and 8.1

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.2.2 Methodology For Equipment Selection	Refer to Figure 3-3 for a flowchart illustrating the various steps involved in selecting safe shutdown equipment. Use the following methodology to select the safe shutdown equipment for a post-fire safe shutdown analysis:

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

This paragraph provides introductory information and contains no specific requirements. Discussion is provided in subsequent sub-sections.

Reference Document

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.2.2.1 Identify the System Flow Path for Each Shutdown Path	Mark up and annotate a P&ID to highlight the specific flow paths for each system in support of each shutdown path. Refer to Attachment 2 for an example of an annotated P&ID illustrating this concept. When developing the SSEL, determine which equipment should be included on the Safe Shutdown Equipment List (SSEL). As an option, include secondary components with a primary component(s) that would be affected by fire damage to the secondary component. By doing this, the SSEL can be kept to a manageable size and the equipment included on the SSEL can be readily related to required post-fire safe shutdown systems and functions.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The Safe Shutdown Equipment List (SSEL) is a list of analyzed components that are utilized in the post-fire safe shutdown analysis to ensure that one success path (structures, systems, and components) necessary to maintain the fuel in a safe and stable condition.~~achieve safe shutdown is free of fire damage without crediting plant or system repair.~~ The SSEL is divided into primary and secondary components. Primary and secondary components were defined as being consistent with NEI 00-01 section 3.2.1.1 guidance. Secondary components were generally combined with primary components.

Combinations of components and systems with the capability to satisfy the required NFPA 805 performance goals ~~safe shutdown functions~~ were designated as safe shutdown flow paths. P&IDs and Electrical drawings were marked up and annotated to highlight the selected primary safe shutdown equipment and flow paths for each system in support of each shutdown path. The specific group of equipment supporting each system was populated into the safe shutdown database.

Reference Document

EIR 51-9133191, NSCA, Sections 4.0 and 6.0

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.2.2.2 Identify the Equipment in Each Safe Shutdown System Flow Path	Review the applicable documentation (e.g. P&IDs, electrical drawings, instrument loop diagrams) to assure that all equipment in each system's flow path has been identified. Assure that any equipment that could spuriously operate and adversely affect the desired system function(s) is also identified. Additionally, refer to Section 4 for the Resolution Methodology for determining the Plant Specific List of MSOs requiring evaluation. Criteria for making the determination as to which of these components are to be classified as required for hot shutdown or as important to SSD is contained in Appendix H. If additional systems are identified which are necessary for the operation of the safe shutdown system under review, include these as required for hot shutdown systems. Designate these new systems with the same safe shutdown path as the primary safe shutdown system under review (Refer to Figure 3-1).

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The safe shutdown flow paths identify the primary components that are required to meet the safe shutdown performance goals. The safe shutdown components were compiled based on each system's performance and safe shutdown function. These components establish the primary safe shutdown flowpath for system operation. Also included in the safe shutdown flow paths are those components whose spurious operation could impact safe shutdown system operability. Systems identified as necessary for the operation of the safe shutdown system under review are included in the safe shutdown equipment list and designated with the same shutdown path as the primary safe shutdown system. These components may involve branch flow paths that must be isolated and remain isolated to assure that flow will not be diverted from the primary flow path. The list of primary components may also include selected mechanical components required to support safe shutdown.

The criteria used in evaluating spurious actuation of components are those identified in NEI 00-01, Section 4, Identification and Treatment of Multiple Spurious Operations (MSO). The Nuclear Safety Capability Fire Area Assessments includes the potential impact of multiple spurious component actuations per the guidance of NEI 00-01. MSO component combinations, as documented in the Technical Report on Identification & Classification of the NMP1 MSO Scenarios Using an Expert Panel - Review of New Generic Scenarios, were addressed in EIR 51-9133191 and included in the fire area assessments.

Reference Document

EIR 51-9133191, NSCA, Sections 4.0, 5.0, 6.0, 8.6.1, and 8.6.3
Technical Report on Identification & Classification of the NMP-1 MSO Scenarios Using an Expert Panel - Review of New Generic Scenarios

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.2.2.3 Assign Safe Shutdown Flow Paths	Prepare a table listing the equipment identified for each system and the shutdown path that it supports. Identify any valves or other equipment that could spuriously operate and impact the operation of that safe shutdown system. Criteria for making the determination as to which of these components are to be classified as required for hot shutdown or as important to SSD is contained in Appendix H. Assign the safe shutdown path for the affected system to this equipment. During the cable selection phase, identify additional equipment required to support the safe shutdown function of the path (e.g., electrical distribution system equipment). Include this additional equipment in the safe shutdown equipment list. Attachment 3 to this document provides an example of a (SSEL). The SSEL identifies the list of equipment within the plant considered for post-fire safe shutdown and it documents various equipment-related attributes used in the analysis. Identify instrument tubing that may cause subsequent effects on instrument readings or signals as a result of fire. Determine and consider the fire area location of the instrument tubing when evaluating the effects of fire damage to circuits and equipment in the fire area.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The Safe Shutdown Equipment List (SSEL) includes equipment for each system supporting the flow paths needed to achieve safe shutdown. This equipment, identified from the highlighted P&IDs, includes both the normal and diversion flow paths required to meet the system performance goals and safe shutdown functions. These components also include valves or equipment that could impact safe shutdown by spuriously operating or whose failure would threaten the capability to achieve safe shutdown. The components were populated into the SSEL database and assigned to safe shutdown system success paths.

During the cable selection process additional support components such as electrical distribution equipment were added to the SSD paths and populated into the database. The database reports produce tables listing equipment and related information which is very similar to the table provided in Attachment 3, of NEI 00-01. This group of components and the various equipment related attributes makes up the SSEL.

Instrument sensing lines for level, pressure, flow, etc. that are exposed to a fire are considered to have the potential of causing erratic or unreliable indication. The instrument tubing lines were traced and their routes correlated to fire areas. Cable identifications were given to the sensing lines and were subjected to the same compliance issues and analytical techniques as safe shutdown cables and similarly analyzed for separation in the fire area assessments.

Reference Document

EIR 51-9133191, NSCA, Sections 4.0, 5.3, 6.0, and 8.4

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.2.2.4 Identify Equipment Information Required for the Safe Shutdown Analysis	Collect additional equipment-related information necessary for performing the post-fire safe shutdown analysis for the equipment. In order to facilitate the analysis, tabulate this data for each piece of equipment on the SSEL. Refer to Attachment 3 to this document for an example of a SSEL. Examples of related equipment data should include the equipment type, equipment description, safe shutdown system, safe shutdown path, drawing reference, fire area, fire zone, and room location of equipment. Other information such as the following may be useful in performing the safe shutdown analysis: normal position, hot shutdown position, cold shutdown position, failed air position, failed electrical position, high/low pressure interface concern, and spurious operation concern. Criteria for making the determination as to which of these components are to be classified as required for hot shutdown or as important to SSD is contained in Appendix H.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The systems and components of the Safe Shutdown Equipment List (SSEL) were selected to meet the NFPA 805 performance goals to ensure the fuel remains in a safe and stable condition.~~achieve post-fire shutdown as specified in 10CFR50, Appendix R.~~ Additional secondary components which are modeled as a result of the primary component selections were also populated into the database.

This additional equipment related information necessary to perform the Fire Area Assessments was collected and included in the SSEL. The SSEL contains the following information; system, train, component, component description, path, Hi/Lo pressure interface determination, normal position, hot shutdown position, cold shutdown position, failed electrical position, failed air position, Fire Area, and Fire Zone.

The SSEL database contains equipment and related information similar to the information identified in Attachment 3 of NEI 00-01. The SSEL contains the primary components which are required for hot shutdown. The secondary components are typically items found within the circuitry for a primary component and provide a supporting role. Components that are important to safe shutdown are all components not classified as required for hot shutdown.

Reference Document

EIR 51-9133191, NSCA, Sections 4.0 and 6.0

2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection

NEI 00-01 Ref	NEI 00-01 Guidance
3.2.2.5 Identify Dependencies Between Equipment, Supporting Equipment, Safe Shutdown Systems and Safe Shutdown Paths.	In the process of defining equipment and cables for safe shutdown, identify additional supporting equipment such as electrical power and interlocked equipment. As an aid in assessing identified impacts to safe shutdown, consider modeling the dependency between equipment within each safe shutdown path either in a relational database or in the form of a Safe Shutdown Logic Diagram (SSLD). Attachment 4 provides an example of a SSLD that may be developed to document these relationships.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

As part of the process of preparing the Safe Shutdown Equipment List (SSEL) and defining equipment and cables for safe shutdown, additional equipment and cables that support the SSEL components were identified (such as interlocked components, normal and alternate electrical power supplies, cascading power supplies). The process included development of a cascading interlock analysis.

This information was populated into a relational type database necessary to analyze for post-fire safe shutdown.

Reference Document

EIR 51-9133191, NSCA, Sections 4.0, 5.0, and 6.0

2.4.2.2 Nuclear Safety Capability Circuit Analysis

2.4.2.2.1 Circuits Required in Nuclear Safety Functions. Circuits required for the nuclear safety functions shall be identified. This includes circuits that are required for operation, that could prevent the operation, or that result in the mal-operation of the equipment identified in 2.4.2.1. This evaluation shall consider fire-induced failure modes such as hot shorts (external and internal), open circuits, and shorts to ground, to identify circuits that are required to support the proper operation of components required to achieve the nuclear safety performance criteria, including spurious operation and signals. This will ensure that a comprehensive population of circuitry is evaluated.

2.4.2.2.2 Other Required Circuits. Other circuits that share common power supply and/or common enclosure with circuits required to achieve nuclear safety performance criteria shall be evaluated for their impact on the ability to achieve nuclear safety performance criteria.

(a) Common Power Supply Circuits. Those circuits whose fire induced failure could cause the loss of a power supply required to achieve the nuclear safety performance criteria shall be identified. This situation could occur if the upstream protection device (i.e., breaker or fuse) is not properly coordinated with the downstream protection device.

(b) Common Enclosure Circuits. Those circuits that share enclosures with circuits required to achieve the nuclear safety performance criteria and whose fire-induced failure could cause the loss of the required components shall be identified. The concern is that the effects of a fire can extend outside of the immediate fire area due to fire-induced electrical faults on inadequately protected cables or via inadequately sealed fire area boundaries.

NEI 00-01 Ref	NEI 00-01 Guidance
3.3 Safe Shutdown Cable Selection And Location	This section provides industry guidance on one acceptable approach for selecting safe shutdown cables and determining their potential impact on equipment required for achieving and maintaining safe shutdown of an operating nuclear power plant for the condition of an exposure fire. The Appendix R safe shutdown cable selection criteria are developed to ensure that all cables that could affect the proper operation or that could cause the mal-operation of safe shutdown equipment are identified and that these cables are properly related to the safe shutdown equipment whose functionality they could affect. Through this cable-to-equipment relationship, cables become part of the safe shutdown path assigned to the equipment affected by the cable. The classification of a cable as either an important to SSD circuit cable or a required safe shutdown cable is also derived from the classification applied to the component that it supports. This classification can vary from one fire area to another depending on the approach used to accomplish post-fire safe shutdown in the area. Refer to Appendix H for the criteria to be used for classifying required and important to SSD components.

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

This paragraph provides introductory information and contains no specific requirements. Discussion is provided in subsequent sub-sections.

Reference Document

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.3.1 Criteria/Assumptions	To identify an impact to safe shutdown equipment based on cable routing, the equipment must have cables that affect it identified. Carefully consider how cables are related to safe shutdown equipment so that impacts from these cables can be properly assessed in terms of their ultimate impact on safe shutdown system equipment. Consider the following criteria when selecting cables that impact safe shutdown equipment:

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

This paragraph provides introductory information and contains no specific requirements. Discussion is provided in subsequent sub-sections.

Reference Document

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.3.1.1.1 Cable Failures	The list of cables whose failure could impact the operation of a piece of safe shutdown equipment includes more than those cables connected to the equipment. The relationship between cable and affected equipment is based on a review of the electrical or elementary wiring diagrams. To assure that all cables that could affect the operation of the safe shutdown equipment are identified, investigate the power, control, instrumentation, interlock, and equipment status indication cables related to the equipment. Review additional schematic diagrams to identify additional cables for interlocked circuits that also need to be considered for their impact on the ability of the equipment to operate as required in support of post-fire safe shutdown. As an option, consider applying the screening criteria from Section 3.5 as a part of this section.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The cables necessary to operate and/or maintain the status of each Safe Shutdown component were evaluated by a detailed review of the drawings. Cables that could impact safe shutdown equipment were identified using the component's control schematic, instrument loop, wiring diagram, if available, or the component's electrical elementary wiring diagrams, one-line drawings, or other available wiring diagrams. These drawings were used as a guide to perform a point to point review of the associated connection diagrams. Cables associated with power, control, instrumentation, indication, interlock and any other cable that could impact the component were considered.

Fault analysis during cable identification led to the cable fault codes P, L, O, C, and I as defined in EIR 51-9133191. This made the final compliance analysis bounding. Further analysis determined the effects of a fire induced hot short, open circuit and short to ground during the fire area compliance assessment task. Additional schematic diagrams were reviewed for secondary or interlocked circuits, as necessary, which could impact the operation of components required for safe shutdown.

Reference Document

EIR 51-9133191, NSCA, Sections 2.6, 7.0, and 8.0
CNG-FES-017, NFPA 805 Safe Shutdown Equipment Cable Selection

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.3.1.1.2 Cable Failures Affecting Multiple Safe Shutdown Equipment	In cases where the failure (including spurious operations) of a single cable could impact more than one piece of safe shutdown equipment, associate the cable with each piece of safe shutdown equipment.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns With Intent

Alignment Basis

For cases where single cables have the potential to impact multiple components, the cable would be listed against each component. For control logic circuits, where multiple components receive signals from common control logic, the control logic was analyzed as a primary component and given a pseudo-component identification.

A pseudo-component is an artificial association of equipment and cables that performs a common function that is combined into a single entity for analysis purposes only and is not an actual plant hardware designation. The pseudo-component was interlocked to the other associated primary components so that the effect of the control logic could be evaluated on an individual component level.

This methodology was used for similar circuit scenarios such as common power supplies. Whereas this approach does not assign the cable to each individual component, the effect on each component due to fire damage is analyzed. This method serves to reduce the duplication of cable data when the same cables are assigned to multiple components.

Pseudo-components and other primary components, whose associated cabling can affect another primary component based on interposing contacts, were identified on the Cable Selection Worksheet of the affected component as an interlocked primary component.

Reference Document

EIR 51-9133191, NSCA, Section 6.0
EIR 51-9177678~~-000~~, Definitions Section

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.3.1.1.2.1 Electrical Devices	Electrical devices such as relays, switches and signal resistor units are considered to be acceptable isolation devices. In the case of instrument loops and electrical metering circuits, review the isolation capabilities of the devices in the loop to determine that an acceptable isolation device has been installed at each point where the loop must be isolated so that a fault would not impact the performance of the safe shutdown instrument function. Refer to Section 3.5 for the types of faults that should be considered when evaluating the acceptability of the isolation device being credited.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Cables were identified and selected using the component's control schematic, electrical elementary diagrams, one-lines, and/or instrument loop diagrams. These drawings were used as a guide while performing a point to point review of the associated connection diagrams.

Electrical isolation devices prevent malfunctions in one section of a circuit from causing unacceptable effects in other portions of the circuit or other circuits (e.g., open contacts, fuses, switches, instrument isolation modules). Devices credited as providing electrical isolation were identified in the circuit analysis for the affected component.

Fault analysis during cable identification led to the P, L, O, C, and I fault codes. All circuits/cables that are electrically connected to the circuit under the analysis are identified up to a credited isolation device including the instrument loops.

Reference Document

EIR 51-9133191, NSCA, Sections 2.6 and 8.3

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.3.1.1.3 Screening Out Cables With No Impact	Screen out cables for circuits that do not impact the safe shutdown function of a component (i.e., annunciator circuits, space heater circuits and computer input circuits) unless some reliance on these circuits is necessary. To be properly screened out, however, the circuits associated with these devices must be isolated from the component's control scheme in such a way that a cable fault would not impact the performance of the circuit. Refer to Section 3.5 for the types of faults that should be considered when evaluating the acceptability of the isolation device being credited.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Cables necessary to operate and/or maintain the status of each safe shutdown component were identified and evaluated by a detailed review of the component's control schematic, elementary diagrams, one-lines, instrument loop diagrams or other available wiring diagrams. These drawings were used as a guide while performing a point to point review of the associated connection diagrams. Cables associated with outputs from auxiliary contacts to computer points, annunciators or motor heaters were excluded from the cable selection when it was concluded that the cable failure would not impact the primary component or performance of the circuit.

Panel wires that are completely contained within a panel were not explicitly listed as SSD cables. These wires are inherently included in the analysis in the same manner as secondary components.

Reference Document

EIR 51-9133191, NSCA, Sections 7.0 and 8.3

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.3.1.1.4 Power Supply to Safe Shutdown Equipment	For each circuit requiring power to perform its safe shutdown function, identify the cable supplying power to each safe shutdown and/or required interlock component. Initially, identify only the power cables from the immediate upstream power source for these interlocked circuits and components (i.e., the closest power supply, load center or motor control center). Review further the electrical distribution system to capture the remaining equipment from the electrical power distribution system necessary to support delivery of power from either the offsite power source or the emergency diesel generators (i.e., onsite power source) to the safe shutdown equipment. Add this equipment to the safe shutdown equipment list. The set of cables described above are classified as required safe shutdown cables. Evaluate the power cables for breaker coordination concerns. The non-safe shutdown cables off of the safe shutdown buses are classified as required for hot shutdown or as important to SSD based on the criteria contained in Appendix H.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The power cables were selected using the component's control schematic or electrical elementary diagrams, one-lines, or instrument loop diagrams or other available wiring diagrams. During the cable selection process, the supporting power sources and interlocks for each primary component were identified. The cascading power supplies (pseudo-components created for power supply interlocks) and the cascading interlocks all serve to identify required power supplies to ensure safe shutdown components are supplied with electrical power. The relationship between the power source and their load components was documented and their dependency was considered during the Fire Area Assessment phase by reviewing the power source load list report from the database.

Breaker coordination calculation 32-9151404-000, Nine Mile Point Unit 1 - NFPA 805 Coordination Study, reviewed the existing and any new electrical circuits that could impact safe shutdown. This calculation identified fire protection program breaker coordination issues concerning proper coordination between the supply breaker/fuse and the load breaker/fuses for power sources required for hot shutdown. This document meets the nuclear safety capability requirements of NFPA-805 and guidance of NEI 00-01.

Reference Document

EIR 51-9133191, NSCA, Section 8.0
EIR 51-9177678~~-000~~, Definitions Section
EIR 32-9151404~~-000~~, Nine Mile Point Unit 1 - NFPA 805 Coordination Study

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.3.1.1.4.1 Automatic Initiation Logics	The automatic initiation logics for the credited post-fire safe shutdown systems are generally not required to support safe shutdown. Typically, each system can be controlled manually by operator actuation in the main control room or emergency control station. The emergency control station includes those plant locations where control devices, such as switches, are installed for the purpose of operating the equipment. If operator actions to manually manipulate equipment at locations outside the MCR or the emergency control station are necessary, those actions must conform to the regulatory requirements on operator manual actions (See Appendix E). If not protected from the effects of fire, the fire-induced failure of automatic initiation logic circuits should be considered for their potential to adversely affect any post-fire safe shutdown system function.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The Safe Shutdown Analysis takes credit for automatic transfer to an alternate power source if the transfer circuit and power source is not affected by the fire. As an example, the EC system can be initiated either manually or automatically. The RPS instruments and logic that automatically initiate the EC system on high reactor pressure or low-low reactor level have been included in the analysis. Manual initiation of the EC system can be accomplished from either the Control Room or RSP depending on the fire location. AC power is not required to manually initiate DHR via the ECs.

Adverse effects due to fire have been considered for the automatic initiation logic circuits. Fire area compliance assessments demonstrate that safe shutdown capability is not adversely affected by a fire in any plant area that disables automatic functions (including initiation logic).

Reference Document

EIR 51-9133191, NSCA, Section 4.0

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.3.1.1.5 Associated Circuits	Cabling for the electrical distribution system is a concern for those breakers that feed circuits and are not fully coordinated with upstream breakers. With respect to electrical distribution cabling, two types of cable associations exist. For safe shutdown considerations, the direct power feed to a primary safe shutdown component is associated with the primary component and classified as a required safe shutdown cable. For example, the power feed to a pump is necessary to support the pump. Similarly, the power feed from the load center to an MCC supports the MCC. However, for cases where sufficient branch-circuit coordination is not provided, the same cables discussed above would also support the power supply. For example, the power feed to the pump discussed above would support the bus from which it is fed because, for the case of a common power source analysis, the concern is the loss of the upstream power source and not the connected load. Similarly, the cable feeding the MCC from the load center would also be necessary to support the load center. Additionally, the non-safe shutdown circuits off of each of the required safe shutdown components in the electrical distribution system can impact safe shutdown if not properly coordinated. These cables are classified as required for hot shutdown based on the criteria contained in Appendix H.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The concern for cabling of the electrical distribution system for primary safe shutdown components involves those breakers that feed associated circuits and may not be fully coordinated with upstream breakers. This involves circuits that are the direct power feed to primary safe shutdown components and/or the power feed to motor control centers that support components or other motor control centers. The concern for these circuits is not the load itself but the upstream power source.

For the NMP1 electrical distribution system, it was assumed that the safe shutdown components and their associated power load were coordinated with their upstream power supplies when identifying cables for all existing and any new safe shutdown components.

For safe shutdown circuits, the cables included the direct power feed from the load center to the component and any cables associated with that component. In addition, coordination was also assumed for any branch circuits related to the safe shutdown component's power source.

Associated circuits are those circuits which are not completely independent of the safe shutdown systems or components. Failure or spurious operation of these circuits could potentially defeat the safe shutdown capability of a safety system. A fire in a given fire area could potentially affect systems and components thought to be independent of that particular fire area.

For the purpose of this analysis, an associated circuit must be associated with both a fire area and a safe shutdown system or component. The associated circuits include circuits which share a common power supply with safe shutdown component and circuits whose spurious operation would adversely affect the safe shutdown capability.

Breaker coordination calculation 32-9151404-000, Nine Mile Point Unit 1 - NFPA 805 Coordination Study, demonstrates the existing coordination status (including any new electrical circuits) for required common power supplies that could impact safe shutdown. This calculation identifies if there are any fire protection program breaker coordination issues concerning proper coordination between the supply breaker/fuse and the load breaker/fuses for power sources required for hot shutdown. This document meets the nuclear safety capability requirements of NEI 00-01 and NFPA-805.

Reference Document

EIR 51-9133191, NSCA, Section 8.5
EIR 32-9151404~~-000~~, Nine Mile Point Unit 1 - NFPA 805 Coordination Study

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.3.1.1.6 Exclusion Analysis	Exclusion analysis may be used to demonstrate a lack of potential for any impacts to post-fire safe shutdown from a component or group of components regardless of the cable routing. For these cases, rigorous cable searching and cable to component associations may not be required.

Applicability	Comments
Not Applicable	None

Alignment Statement

Not Required

Alignment Basis

Exclusion analysis was not used to demonstrate a lack of potential for any impacts to post-fire safe-shutdown.

Reference Document

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref

3.3.2 Associated Circuit Of Concern Cables

NEI 00-01 Guidance

Appendix R, through the guidance provided in NRC Generic Letter 81-12, requires that separation features be provided for associated non-safety circuits that could prevent operation or cause mal-operation due to hot shorts, open circuits, or shorts to ground, of redundant trains of systems necessary to achieve hot shutdown. The three types of associated circuits were identified in Reference 7.1.5 and further clarified in a NRC memorandum dated March 22, 1982 from R. Mattson to D. Eisenhut, Reference 7.1.6. They are as follows:

- Spurious actuations
- Common power source
- Common enclosure.

Each of these cables is classified as an associated circuit of concern cable.

Cables Whose Failure May Cause Spurious Operations

Safe shutdown system spurious operation concerns can result from fire damage to a cable whose failure could cause the spurious operation/mal-operation of equipment whose operation could affect safe shutdown. These cables are identified in Section 3.3.3 together with the remaining safe shutdown cables required to support control and operation of the equipment.

Common Power Source Cables

The concern for the common power source associated circuits of concern is the loss of a safe shutdown power source due to inadequate breaker/fuse coordination. In the case of a fire-induced cable failure on a non-safe shutdown load circuit supplied from the safe shutdown power source, a lack of coordination between the upstream supply breaker/fuse feeding the safe shutdown power source and the load breaker/fuse supplying the non-safe shutdown faulted circuit can result in loss of the safe shutdown bus. This would result in the loss of power to the safe shutdown equipment supplied from that power source preventing the safe shutdown equipment from performing its required safe shutdown function. Identify these cables together with the remaining safe shutdown cables required to support control and operation of the equipment. Refer to Section 3.5.2.4 for an acceptable methodology for analyzing the impact of these cables on post-fire safe shutdown.

Common Enclosure Cables

The concern with common enclosure associated circuits of concern is fire damage to a cable whose failure could propagate to other safe shutdown cables in the same enclosure either because the circuit is not properly protected by an isolation device (breaker/fuse) such that a fire-induced fault could result in ignition along its length, or by the fire propagating along the cable and into an adjacent fire area. This fire spread to an adjacent fire area could impact safe shutdown equipment in that fire area, thereby resulting in a condition that exceeds the criteria and assumptions of this methodology (i.e., multiple fires). Refer to Section 3.5.2.5 for an acceptable methodology for analyzing the impact of these cables on post-fire safe shutdown.

Applicability

Applicable

Comments

None

Alignment Statement

Not Required

Alignment Basis

This section is a generic discussion concerning the separation of Associated Circuit Cables and non-safety circuits of components required for safe shutdown. This information is discussed in more detail in subsequent sub-sections 3.3.3, 3.5.2.4 and 3.5.2.5.

Reference Document

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.3.3 Methodology for Cable Selection and Location	Refer to Figure 3-4 for a flowchart illustrating the various steps involved in selecting the cables necessary for performing a post-fire safe shutdown analysis. Use the following methodology to define the cables required for safe shutdown including cables that may be circuits of concerns for a post-fire safe shutdown analysis. Criteria for making the determination as to which circuits are to be classified as required for hot shutdown or as important to SSD is contained in Appendix H.

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

This paragraph provides introductory information and contains no specific requirements. Discussion is provided in subsequent sub-sections.

Reference Document

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.3.3.1 Identify Circuits Necessary for the Operation of the Safe Shutdown Equipment	For each piece of safe shutdown equipment defined in section 3.2, review the appropriate electrical diagrams including the following documentation to identify the circuits (power, control, instrumentation) required for operation or whose failure may impact the operation of each piece of equipment: ▪ Single-line electrical diagrams ▪ Elementary wiring diagram ▪ Electrical connection diagrams ▪ Instrument loop diagrams. For electrical power distribution equipment such as power supplies, identify any circuits whose failure may cause a coordination concern for the bus under evaluation. If power is required for the equipment, include the closest upstream power distribution source on the safe shutdown equipment list. Through the iterative process described in Figures 3-2 and 3-3, include the additional upstream power sources up to either the offsite or the emergency power source.
Applicability	**Comments**
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Cable selection was performed to identify all conductors/wires that may be required for a component to perform its safe shutdown function, or whose failure could be adverse to the component's safe shutdown function. The cables were selected by a point-to-point review of the applicable connection diagrams, single line electrical diagrams, elementary wiring diagrams or instrument loop wiring diagrams.

During the initial review, any cable that had a potential to impact the safe shutdown component was identified and associated to that component. Cables identified for each Safe Shutdown component, including any additional reference drawings, were populated in the database during the cable selection process. Cables that are computer inputs or that have adequate isolation are excluded.

Figures 3-2 and 3-3 of NEI 00-01 were used to develop the Safe Shutdown Systems, the systems Paths and Safe Shutdown Equipment List. These lists included electrical distribution equipment identified for circuits whose failure may cause a coordination concern. The power related electrical equipment included upstream power sources up to either offsite power or the emergency power source.

Coordination of power supplies was assumed when assigning cables to the safe shutdown components; however, this may not encompass any new components and circuits being added to the program. Breaker coordination calculation 32-9151404-000, Nine Mile Point Unit 1 - NFPA 805 Coordination Study, demonstrates the existing coordination status for the required common power sources. This calculation identifies if there are any fire protection program breaker coordination issues concerning proper coordination between the supply breaker/fuse and the load breaker/fuses for power sources required for hot shutdown. This document meets the nuclear safety capability requirements of NEI 00-01, Section 3.5.2.4 and Figure 3.5.2-6, and NFPA 805, Section 2.4.2.2.2.

Reference Document

EIR 51-9133191, NSCA, Sections 7.0 and 8.0
EIR 32-9151404~~-000~~, Nine Mile Point Unit 1 - NFPA 805 Coordination Study

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.3.3.2 Identify Interlocked Circuits and Cables that Could Affect Safe Shutdown	In reviewing each control circuit, investigate interlocks that may lead to additional circuit schemes, cables and equipment. Assign to the equipment any cables for interlocked circuits that can affect the equipment. While investigating the interlocked circuits, additional equipment or power sources may be discovered. Include these interlocked equipment or power sources in the safe shutdown equipment list (refer to Figure 3-3) if they can impact the operation of the equipment under consideration in an undesirable manner that impacts post-fire safe shutdown.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns With Intent

Alignment Basis

For control logic circuits where multiple components receive signals from a common logic, the control logic was analyzed as a primary component and a pseudo-component identification was created for the control logic. A pseudo-component is an artificial association of equipment and cables that performs a common function into a single entity for analysis purposes. The pseudo-component is not an actual plant hardware designation.

The pseudo-component was interlocked to the other associated primary components so that the effect of the control logic could be evaluated on an individual component level. This methodology was used for similar circuit scenarios such as common power supplies. Whereas this approach does not assign the cable to each individual component, the effect on each component due to fire damage is analyzed. This method serves to reduce the duplication of cable data when the same cables are assigned to multiple components.

Pseudo-components and other primary components whose associated cabling can affect another primary component based on interposing contacts were identified on the Cable Selection Worksheet of the affected component as an interlocked primary component. This meets the intent of the guidance.

Reference Document

EIR 51-9133191, NSCA, Sections 5.4 and 6.0
EIR 51-9177678~~-000~~, Definitions Section

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.3.3.3 Assign Cables to Safe Shutdown Equipment	Given the criteria/assumptions defined in Section 3.3.1, identify the cables required to operate or that may result in mal-operation of each piece of safe shutdown equipment. Cables are classified as either required for hot shutdown or important to SSD based on the classification of the component to which they are associated and the function of that component in supporting post-fire safe shutdown in each particular fire area. Refer to Appendix H for additional guidance. Tabulate the list of cables potentially affecting each piece of equipment in a relational database including the respective drawing numbers, their revision and any interlocks that are investigated to determine their impact on the operation of the equipment. In certain cases, the same cable may support multiple pieces of equipment. Relate the cables to each piece of equipment, but not necessarily to each supporting secondary component. If adequate coordination does not exist for a particular circuit, relate the power cable to the power source. This will ensure that the power source is identified as affected equipment in the fire areas where the cable may be damaged. Criteria for making the determination as to which cables are to be classified as required for hot shutdown or as important to SSD is contained in Appendix H.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Cable selection for Safe Shutdown components was performed by identifying all cables required for a component to perform its safe shutdown function. These cables were selected by a point-to-point review using the component's elementary diagram. The cables were selected in accordance with NEI 00-01, Section 3.3.1 and then entered into the database. For cases where cables affected multiple components, either the cable was assigned to each component or a pseudo-component was used with the cables assigned to the pseudo-component instead of the primary component.

In addition to the cables, any component interlocks were identified to investigate their impact on the operation of the safe shutdown component. The relationship between these interlocks and the primary component were documented and their dependency was considered during the Fire Area Compliance Assessment.

Coordination of power supplies is addressed in Section 3.5.2.4 of this document.

Reference Document

EIR 51-9133191, NSCA, Section 8.0
EIR 51-9177678~~-000~~, Definitions Section

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.5 Circuit Analysis and Evaluation	This section on circuit analysis provides information on the potential impact of fire on circuits used to monitor, control and power required for hot shutdown and important to safe shutdown equipment. Applying the circuit analysis criteria will lead to an understanding of how fire damage to the cables may affect the ability to achieve and maintain post-fire safe shutdown in a particular fire area. This section should be used in conjunction with Section 3.4, to evaluate the potential fire-induced impacts that require mitigation. Additionally, when assessing fire-induced damage to circuits that could potentially result in MSOs, the circuit failure criteria in Appendix B should be used. Appendix R Section III.G.2 identifies the fire-induced circuit failure types that are to be evaluated for impact from exposure fires on safe shutdown equipment. Section III.G.2 of Appendix R requires consideration of hot shorts, shorts-to-ground and open circuits.

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

This paragraph provides introductory information and contains no specific requirements. Discussion is provided in subsequent sub-sections.

Reference Document

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.5.1 Criteria/Assumptions	Apply the following criteria/assumptions when performing fire-induced circuit failure evaluations. Refer to the assessment of the NEI/EPRI and CAROLFIRE Cable Test Results in Appendix B to this document for the basis for these criteria and for further elaboration on the application of the criteria.

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

This paragraph provides introductory information and contains no specific requirements. Discussion is provided in subsequent sub-sections.

Reference Document

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.5.1.1 Circuit Failure Criteria	Circuit Failure Criteria: The criteria provided below addresses the effects of multiple fire-induced circuit failures impacting circuits for components classified as either "required for hot shutdown" or "important to safe shutdown". Consider the following circuit failure types on each conductor of each unprotected cable. Criteria differences, however, do apply depending on whether the component is classified as required for hot shutdown or important to safe shutdown. • A hot short may result from a fire-induced insulation breakdown between conductors of the same cable, a different cable or from some other external source resulting in a compatible but undesired impressed voltage or signal on a specific conductor. A hot short may cause a spurious operation of safe shutdown equipment. o A hot short in the control circuitry for an MOV can bypass the MOV protective devices, i.e. torque and limit switches. This is the condition described in NRC Information Notice 92-18. In this condition, the potential exists to damage the MOV motor and/or valve. Damage to the MOV could result in an inability to operate the MOV either remotely, using separate controls with separate control power, or manually using the MOV hand wheel. This condition could be a concern in two instances: (1) For fires requiring Control Room evacuation and remote operation from the Remote Shutdown Panel, the Auxiliary Control Panel or Auxiliary Shutdown Panel; (2) For fires where the selected means of addressing the effects of fire induced damage is the use of an operator manual action. In each case, analysis must be performed to demonstrate that the MOV can be subsequently operated electrically or manually, as required by the safe shutdown analysis. • An open circuit may result from a fire-induced break in a conductor resulting in the loss of circuit continuity. An open circuit may prevent the ability to control or power the affected equipment. An open circuit may also result in a change of state for normally energized equipment. (e.g. [for BWRs] loss of power to the Main Steam Isolation Valve (MSIV) solenoid valves due to an open circuit will result in the closure of the MSIVs). [Note: Open circuits as a result of conductor melting have not occurred in any of the recent cable fire testing and they are not considered to be a viable form of cable failure.] • A short-to-ground may result from a fire-induced breakdown of a cable insulation system, resulting in the potential on the conductor being applied to ground potential. A short-to-ground may have all of the same effects as an open circuit and, in addition, a short-to-ground may also cause an impact to the control circuit or power train of which it is a part. A short-to-ground may also result in a change of state for normally energized equipment. Circuits for "required for hot shutdown" components: Because Appendix R Section III.G.1 requires that the hot shutdown capability remain "free of fire damage", there is no limit on the number of concurrent/simultaneous fire-induced circuit failures that must be considered for circuits for components "required for hot shutdown: located within the same fire area. For components classified as "required for hot shutdown", there is no limit on the duration of the hot short. It must be assumed to exist until an action is taken to mitigate its effects. Circuits required for the operation of or that can cause the mal-operation of "required for hot shutdown" components that are impacted by a fire are considered to render the component unavailable for performing its hot shutdown function unless these circuits are properly protected as described in the next sentence. The required circuits for any "required for hot shutdown" component, if located within the same fire area where they are credited for achieving hot shutdown, must be protected in accordance with one of the requirements of Appendix R Section III.G.2 or plant specific license conditions.

Circuits for "important to safe shutdown" components: Circuits for components classified as "important to safe shutdown" are not specifically governed by the requirements of Appendix R Section III.G.1, III.G.2 or III.G.3. To address fire-induced impacts on these circuits, consider the three types of circuit failures identified above to occur individually on each conductor with the potential to impact any "important to safe shutdown" component with the potential to impact components "required for hot shutdown". In addition, consider the following additional circuit failure criteria for circuits for "important to safe shutdown" components located within the same fire area with the potential to impact components "required for hot shutdown":

- As explained in Figure 3.5.2-3, multiple shorts-to-ground are to be evaluated for their impact on ungrounded circuits.
- As explained in Figure 3.5.2-5, for ungrounded DC circuits, a single hot short from the same source is assumed to occur unless it can be demonstrated that the occurrence of a same source short is not possible in the affected fire area. If this approach is used, a means to configuration control this condition must be developed and maintained.
- For the double DC break solenoid circuit design discussed in the NRC Memo from Gary Holahan, Deputy Director Division of Systems Technology, dated December 4, 1990 and filed under ML062300013, the effect of two hot shorts of the proper polarity in the same multi-conductor cable should be analyzed for non-high low pressure interface components. [Reference Figure B.3.3 (f) of NFPA 805-2001.]
- Multiple spurious operations resulting from a fire-induced circuit failure affecting a single conductor must be included in the post-fire safe shutdown analysis.
- Multiple fire-induced circuit failures affecting multiple conductors within the same multi-conductor cable with the potential to cause a spurious operation of an "important to safe shutdown" component must be assumed to exist concurrently.
- Multiple fire-induced circuit failures affecting separate conductors in separate cables with the potential to cause a spurious operation of an "important to safe shutdown" component must be assumed to exist concurrently when the effect of the fire-induced circuit failure is sealed-in or latched.
- Conversely, multiple fire-induced circuit failures affecting separate conductors in separate cables with the potential to cause a spurious operation of an "important to safe shutdown" component need not be assumed to exist concurrently when the effect of the fire-induced circuit failure is not sealed-in or latched. This criterion applies to consideration of concurrent hot shorts in secondary circuits and to their effect on a components primary control circuit. It is not to be applied to concurrent single hot shorts in primary control circuit for separate components in an MSO combination.
- For components classified as "important to safe shutdown", the duration of a hot short may be limited to 20 minutes. (If the effect of the spurious actuation involves a "sealing in" or "latching" mechanism, that is addressed separately from the duration of the spurious actuation, as discussed above.)
- For any impacted circuits for "important to safe shutdown" components that are located within the same fire area, protection in accordance with the requirements of Appendix R Section III.G.2 or plant specific license conditions may be used. In addition, consideration may be given to the use of fire modeling or operator manual actions, as an alternative to the requirements of Appendix R Section III.G.2. (Other resolution options may also be acceptable, if accepted by the Authority Having Jurisdiction.)

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

During the cable selection process, a circuit fault analysis for each component cable was initially performed to determine the effects of a fire-induced hot short, open circuit and short to ground, as applicable. Per the NEI 00-01 guidance, all combinations of circuit failures (hot shorts, open circuit, and short-to ground) on each conductor for each unprotected safe shutdown cable were considered. Further analysis was performed, as required, for secondary or interlocked circuits.

The circuit failures were evaluated to determine the potential impact of a fire on the safe shutdown equipment (including the path) that is associated with that cable/conductor. In some cases, the cables and components had adequate separation from their redundant circuits and components as required by the regulations and were not required to be analyzed.

It was assumed that fire damage results in an unusable cable that cannot be considered functional with regard to ensuring proper circuit operation. The insulation and external jacket material of electrical cables are susceptible to fire damage. Damage may assume several forms including deformation, loss of structure, cracking, and ignition. The relationship between exposure of electrical cable insulation to fire conditions, the failure mode, and time to failure may vary with the configuration and cable type. To accommodate these uncertainties in a consistent and conservative manner, the circuit analysis assumes that the functional integrity of electrical cables is lost when cables are exposed to a fire, except where protected by a fire rated barrier.

The types of circuit failures considered for this analysis are those identified in NEI 00-01, Appendix B, Table B.1.0, "Types of Fire-Induced Circuit Failures Required to Be Considered." Consistent with NEI 00-01, hot shorts were considered to be either internal cable wire-to-wire shorts or external cable-to-cable shorts. No credit was taken for physical cable attributes (armored, thermo-set, etc.) preventing cable-to-cable hot shorts.

Reference Document

EIR 51-9133191, NSCA, Section 8.2
HNP RAI 3-16, NRC Request for Addition Information (ML092170715)

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.5.1.2 Spurious Operation Criteria	Spurious Operation Criteria: The following criteria address the effect of multiple spurious operations of components classified as either "required for hot shutdown" or "important to safe shutdown" on post-fire safe shutdown. These criteria are to be applied to the population of components whose spurious operation has been determined to be possible based on an application of the circuit failure criteria described above when assessing impacts to post-fire safe shutdown capability in any fire area. ▪ The set of concurrent combinations of spurious operations provided through the MSO Process outlined in Section 4 and the list of MSO contained in Appendix G must be included in the analysis of MSOs. ▪ MSOs do not need to be combined, except as explained in Section 4.4.3.4 of this document. ▪ Section 4.4.3.4 states that the expert panel should review the plant specific list of MSOs to determine whether any of the individual MSOs should be combined due to the combined MSO resulting in a condition significantly worse than either MSO individually. ▪ In this review, consideration of key aspects of the MSOs should be factored in, such as the overall number of spurious operations in the combined MSOs, the circuit attributes in Appendix B, and other physical attributes of the scenarios. o Specifically, if the combined MSOs involve more than a total of four components or if the MSO scenario requires consideration of sequentially selected cable faults of a prescribed type, at a prescribed time, in a prescribed sequence in order for the postulated MSO combination to occur, then this is considered to be beyond the required design basis for MSOs.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

An MSO Expert panel reviewed the generic list of scenarios listed in NEI-00-01 Appendix G, screening out any scenario that was a combination of five or more spurious operations. There were no screening criteria based on number, timing, or type of circuit failures. The result of the review was a list of MSO scenarios, both generic and site specific, that were included in the Fire Area Analysis for further evaluation.

Reference Document

EIR 51-9133191, NSCA, Section 8.1
ONS RAI 3-38, NRC Request for Additional Information dated July 30, 2010 (ML102110394)
Technical Report on Identification & Classification of the NMP-1 MSO Scenarios Using an Expert Panel - Review of New Scenarios, Rev.1

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.5.1.3 Circuit Contact Position	Assume that circuit contacts are initially positioned (i.e., open or closed) consistent with the normal mode/position of the "required for hot shutdown" or "important to safe shutdown" equipment as shown on the schematic drawings. The analyst must consider the position of the "required for hot shutdown" and "important to safe shutdown" equipment for each specific shutdown scenario when determining the impact that fire damage to a particular circuit may have on the operation of the "required for hot shutdown" and "important to safe shutdown equipment".

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The analysis assumes that the circuit contacts are positioned (i.e., open or closed) consistent in the normal mode/position of the safe shutdown equipment as shown on the schematic drawings or defined by procedure. The fire damage impact on the position of the safe shutdown equipment was considered for each shutdown scenario.

Reference Document

EIR 51-9133191, NSCA, Section 8.6.1

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.5.2 Types Of Circuit Failures	Appendix R requires that nuclear power plants must be designed to prevent exposure fires from defeating the ability to achieve and maintain post-fire safe shutdown. Fire damage to circuits that provide control and power to equipment required for hot shutdown and important to safe shutdown in each fire area must be evaluated for the effects of a fire in that fire area. Only one fire at a time is assumed to occur. The extent of fire damage is assumed to be limited by the boundaries of the fire area. Given this set of conditions, it must be assured that one redundant train of equipment necessary to achieve and maintain hot shutdown is free of fire damage for fires in every plant location. To provide this assurance, Appendix R requires that equipment and circuits required for hot shutdown be free of fire damage and that these circuits be designed for the fire-induced effects of a hot short, short-to-ground, or an open circuit. With respect to the electrical distribution system, the issue of breaker coordination must also be addressed. Criteria for making the determination as to which breakers are to be classified as required for hot shutdown is contained in Appendix H. This section will discuss specific examples of each of the following types of circuit failures: ▪ Open circuit ▪ Short-to-ground ▪ Hot short Also, refer to Appendix B for the circuit failure criteria to be applied in assessing the impact of the Plant Specific List of MSOs on post-fire safe shutdown.

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

This paragraph provides introductory information and contains no specific requirements. Discussion is provided in subsequent sub-sections.

Reference Document

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.5.2.1 Circuit Failures Due to an Open Circuit	This section provides guidance for addressing the effects of an open circuit for required for hot shutdown and important to safe shutdown equipment. An open circuit is a fire-induced break in a conductor resulting in the loss of circuit continuity. An open circuit will typically prevent the ability to control or power the affected equipment. An open circuit can also result in a change of state for normally energized equipment. For example, a loss of power to the main steam isolation valve (MSIV) solenoid valves [for BWRs] due to an open circuit will result in the closure of the MSIV. ▪ Loss of electrical continuity may occur within a conductor resulting in de-energizing the circuit and causing a loss of power to, or control of, the required for hot shutdown and important to safe shutdown equipment. ▪ In selected cases, a loss of electrical continuity may result in loss of power to an interlocked relay or other device. This loss of power may change the state of the equipment. Evaluate this to determine if equipment fails safe. ▪ Open circuit on a high voltage (e.g., 4.16 kV) ammeter current transformer (CT) circuit may result in secondary damage, possibly resulting in the occurrence of an additional fire in the location of the CT itself.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Open circuits are analyzed as referenced in the NEI 00-01 guidance, Section 3.5.2.1 and Figure 3.5.2-1. An open circuit is a condition experienced when an individual conductor within a cable loses electrical continuity due to a fire induced break. This could cause the loss of power from de-energizing the circuit or the ability to control affected components, or on energized equipment could cause a change of position of the component. In addition, as stated in the guidance, an open circuit on a high voltage ammeter CT circuit may result in secondary damage to that circuit.

The Nuclear Safety Capability Assessment (NSCA) assumed that fire damage results in an unusable cable that cannot be considered functional with regard to ensuring proper circuit operation. The insulation and external jacket material of electrical cables are susceptible to fire damage. Damage may assume several forms including deformation, loss of structure, cracking, and ignition. The relationship between exposure of electrical cable insulation to fire conditions, the failure mode, and time to failure may vary with the configuration and cable type. To accommodate these uncertainties in a consistent and conservative manner, the circuit analysis assumes that the functional integrity of electrical cables was lost when cables are exposed to a fire, except where protected by a fire rated barrier.

Other associated circuit concerns are related to open secondary circuits and 4 KV bus CT that may result in high currents producing an additional fire at the transformer location. This associated circuit concern is related to CT where an open secondary circuit may develop high voltages within a transformer potentially resulting in a secondary fire at the transformer location. This issue is evaluated in Fire Protection Engineering Evaluation FPEE-1-04-002, Rev. 0, Fire Effects on CTs and Instrument Sensing Lines and The Plant Safe Shutdown Capability. The evaluation concludes that, for all CTs in use at NMP1, an open transformer secondary will not develop voltages that are high enough to threaten the Safe Shutdown capability.

Reference Document

EIR 51-9133191, NSCA, Sections 8.2 and 8.5
Fire Protection Engineering Evaluation FPEE-1-04-002, Rev. 0, Fire Effects on CTs
ONS RAI 3-48, NRC Request for Additional Information dated July 30, 2010 (ML102110394)
HNP RAI 3-17, NRC Request for Additional Information dated August 6, 2009 (ML092170715)

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.5.2.2 Circuit Failures Due to a Short-to-Ground	This section provides guidance for addressing the effects of a short-to-ground on circuits for required for hot shutdown and important to safe shutdown equipment. A short-to-ground is a fire-induced breakdown of a cable insulation system resulting in the potential on the conductor being applied to ground potential. A short-to-ground can cause a loss of power to or control of required safe shutdown equipment. In addition, a short-to-ground may affect other equipment in the electrical power distribution system in the cases where proper coordination does not exist. There is no limit to the number of shorts-to-ground that could be caused by the fire. Consider the following consequences in the post-fire safe shutdown analysis when determining the effects of circuit failures related to shorts-to-ground: ▪ A short to ground in a power or a control circuit may result in tripping one or more isolation devices (i.e. breaker/fuse) and causing a loss of power to or control of required safe shutdown equipment. ▪ In the case of certain energized equipment such as HVAC dampers, a loss of control power may result in loss of power to an interlocked relay or other device that may cause one or more spurious operations.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The methodology assumes multiple fire induced failures including short-to-ground. The short-to-ground issue incorporates circuit failures for both ungrounded and grounded circuits. Postulated cable and component failures were identified utilizing the techniques referenced in NEI 00-01 Figure 3.5.2-2 and Figure 3.5.2-3. The safe shutdown analysis may exclude certain cables if their postulated fire induced faults have no adverse effect on the component.

A short-to-ground fault for grounded circuits could cause the tripping of a circuit thereby causing a loss of power to the control circuit. For certain cases of energized components, a loss of control power may result in a loss of power to relays and other devices interlocked with the device.

Unless otherwise justified by circuit analysis, short- to-ground for ungrounded circuits are treated the same as short- to-ground for grounded circuits, and are postulated to result in a loss of motive power or control power. This is consistent with NFPA 805 Appendix B, Section B.3.2.g which states: "For ease of analysis when analyzing an ungrounded DC circuit for the effects of a short-to-ground, it should be assumed that an existing ground fault from the same power source is present."

Reference Document

EIR 51-9133191, NSCA, Sections 8.1 and 8.2
NFPA 805, Appendix B, Section B.3.2.g

2.4.2.2 Nuclear Safety Capability Circuit Analysis

NEI 00-01 Ref	NEI 00-01 Guidance
3.5.2.3 Circuit Failures Due to a Hot Short	This section provides guidance for analyzing the effects of a hot short on circuits for required for required for hot shutdown and important to safe shutdown equipment. A hot short is defined as a fire-induced insulation breakdown between conductors of the same cable, a different cable or some other external source resulting in an undesired impressed voltage on a specific conductor. The potential effect of the undesired impressed voltage would be to cause equipment to operate or fail to operate in an undesired manner. Consider the following specific circuit failures related to hot shorts as part of the post-fire safe shutdown analysis: ▪ A hot short between an energized conductor and a de-energized conductor within the same cable may cause a spurious operation of equipment. The spuriously operated device (e.g., relay) may be interlocked with another circuit that causes the spurious operation of other equipment. This type of hot short is called an intra-cable hot short (also known as conductor-to-conductor hot short or an internal hot short). ▪ A hot short between any external energized source such as an energized conductor from another cable and a de-energized conductor may also cause a spurious operation of equipment. This is called an inter-cable hot short (also known as cable-to-cable hot short/external hot short). ▪ A hot short in the control circuitry for an MOV can bypass the MOV protective devices, i.e. torque and limit switches. This is the condition described in NRC Information Notice 92-18. In this condition, MOV motor damage can occur. Damage to the MOV motor could result in an inability to operate the MOV either remotely, using separate controls with separate control power, or manually using the MOV hand wheel. This condition could be a concern in two instances: (1) For fires requiring Control Room evacuation and remote operation from the Remote Shutdown Panel; (2) For fires where the selected means of addressing the effects of fire induced damage is the use of an operator manual action. In this latter case, analysis must be performed to demonstrate that the MOV thrust at motor failure does not exceed the capacity of the MOV hand wheel. For either case, analysis must demonstrate the MOV thrust at motor failure does not damage the MOV pressure boundary.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

A hot short is a condition experienced when an energized individual conductor of the same or different cable comes into contact with another conductor of the same or different cable resulting in electrical continuity between the conductors. The potential effect is that the energized conductor becomes an undesired source of power for the circuit being analyzed. Hot shorts were considered to be either internal conductors of the same cable, identified as internal shorts, or shorts between conductors of different cables, identified as external shorts. The potential of circuit failures due to hot shorts can cause components to operate or cause them to fail to operate in an undesired manner.

The Nuclear Safety Capability Assessment (NSCA) assumed that fire damage results in an unusable cable that cannot be considered functional with regard to ensuring proper circuit operation. The insulation and external jacket material of electrical cables are susceptible to fire damage. Damage may assume several forms including deformation, loss of structure, cracking, and ignition. The relationship between exposure of electrical cable insulation to fire conditions, the failure mode, and time to failure may vary with the configuration and cable type. To accommodate these uncertainties in a consistent and conservative manner, the circuit analysis assumes that the functional integrity of electrical cables is lost when cables are exposed to a fire, except where protected by a fire rated barrier.

Consistent with NEI 00-01, hot shorts were considered to be either internal cable wire-to-wire shorts or cable-to-cable (external) shorts. No credit was taken for physical cable attributes (armored, thermo-set, etc.) preventing cable-to-cable hot shorts.

For cable failures due to hot shorts on grounded or ungrounded circuits, the methodology initially assumes the hot short would have sufficient potential to cause a spurious operation of the component. Two types of cable hot short conditions are considered to be of sufficiently low likelihood that they are not assumed credible, except for analysis involving high/low pressure interface components. These hot shorts are 3-phase AC power circuit cable-to-cable proper phase sequence faults and 2-wire ungrounded DC circuit cable-to-cable proper polarity faults.

Instrument circuits that operate at low signal levels (4-20 mA, 0-1 V, 1-5 V, etc.) and are enclosed in a grounded metal shield are not considered to be susceptible to hot shorts from other adjacent instrument circuits external to the shield. External circuits are assumed to short to ground via the shield and do not have the potential of creating a signal of proper polarity and amplitude to simulate a valid instrument signal.

Reference Document

EIR 51-9133191, NSCA, Section 8.2
ONS RAI 3-41, NRC Request for Additional Information dated July 30, 2010 (ML102110394)

2.4.2.3 Nuclear Safety Equipment and Cable Location

Physical location of equipment and cables shall be identified.

NEI 00-01 Ref	NEI 00-01 Guidance
3.3.3.4 Identify Routing of Cables	Identify the routing for each cable including all raceway and cable endpoints. Typically, this information is obtained from joining the list of safe shutdown cables with an existing cable and raceway database.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

This task involved identifying the routing and location for all raceways and endpoints for cables associated with safe shutdown equipment. The cable routes and their endpoint location were populated into the database. The database is a relational database that contains all the required information for safe shutdown cable routing and endpoint information. The original cable routing and cable endpoint data was provided from the NMP1 cable raceway database (TRAK2000).

Comments

None

Reference Document

EIR 51-9133191, NSCA, Sections 2.1 and 8.4
TRAK2000, Revision 6.01

2.4.2.3 Nuclear Safety Equipment and Cable Location

NEI 00-01 Ref	NEI 00-01 Guidance
3.3.3.5 Identify Raceway and Cables by Fire Area	Identify the fire area location of each raceway and cable endpoint identified in the previous step and join this information with the cable routing data. For raceway and cable endpoints in multiple fire areas, each fire area where the raceway or cable endpoint exists must be included. In addition, identify the location of field-routed cable by fire area. This produces a database containing all of the cables requiring fire area analysis, their locations by fire area, and their raceway.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Fire area locations were identified for each cable raceway and cable endpoint by obtaining the location coordinates from applicable cable tray, conduit or equipment layout arrangement drawings or by field walkdown, if necessary. The fire area locations were identified by comparing the cable tray/conduit arrangement drawings, equipment arrangement drawings, or field walkdown data with Fire Area Floor Plans drawings. This correlation between cable raceway locations and Fire Areas and Rooms was populated into the database to produce computer generated reports. The reports contained the cable related raceway information required to prepare the Fire Area Analysis.

Reference Document

EIR 51-9133191, NSCA, Sections 5.4 and 8.4
Fire Area Floor Plans Drawings B40141C through B40148C

2.4.2.3 Nuclear Safety Equipment and Cable Location

NEI 00-01 Ref	NEI 00-01 Guidance

3.5.2.4 Circuit Failures Due to Inadequate Circuit Coordination	The evaluation of circuits of a common power source consists of verifying proper coordination between the supply breaker/fuse and the load breakers/fuses for power sources that are required for hot shutdown. The concern is that, for fire damage to a single power cable, lack of coordination between the supply breaker/fuse and the load breakers/fuses can result in the loss of power to a safe shutdown power source that is required to provide power to safe shutdown equipment.
	
	A coordination study should demonstrate the coordination status for each required common power source. For coordination to exist, the time-current curves for the breakers, fuses and/or protective relaying must demonstrate that a fault on the load circuits is isolated before tripping the upstream breaker that supplies the bus. Furthermore, the available short circuit current on the load circuit must be considered to ensure that coordination is demonstrated at the maximum fault level.
	
	The methodology for identifying potential circuits of a common power source and evaluating circuit coordination cases on a single circuit fault basis is as follows:
	▪ Identify the power sources required to supply power to safe shutdown equipment.
	▪ For each power source, identify the breaker/fuse ratings, types, trip settings and coordination characteristics for the incoming source breaker supplying the bus and the breakers/fuses feeding the loads supplied by the bus.
	▪ For each power source, demonstrate proper circuit coordination using acceptable industry methods. For example, for breakers that have internal breaker tripping devices and do not require control power to trip the breaker, assure that the time-current characteristic curve for any affected load breaker is to the left of the time-current characteristic curve for the bus feeder breaker and that the available short circuit current for each affected breaker is to the right of the time-current characteristic curve for the bus feeder breaker or that the bus feeder breaker has a longer time delay in the breaker instantaneous range than the load breaker. For breakers requiring control power for the breaker to trip, the availability of the required control power must be demonstrated in addition to the proper alignment of the time-current characteristic curves described above. The requirement for the availability of control power would apply to load breakers fed from each safe shutdown bus where a fire-induced circuit failure brings into questions the availability of coordination for a required for hot shutdown component.
	▪ For power sources not properly coordinated, tabulate by fire area the routing of cables whose breaker/fuse is not properly coordinated with the supply breaker/fuse. Evaluate the potential for disabling power to the bus in each of the fire areas in which the circuit of concern are routed and the power source is required for hot shutdown. Prepare a list of the following information for each fire area:
	    ▪ Cables of concern.
	    ▪ Affected common power source and its path.
	    ▪ Raceway in which the cable is enclosed.
	    ▪ Sequence of the raceway in the cable route.
	    ▪ Fire zone/area in which the raceway is located.
	
	For fire zones/areas in which the power source is disabled, the effects are mitigated by appropriate methods.
	▪ Develop analyzed safe shutdown circuit dispositions for the circuit of concern cables routed in an area of the same path as required by the power source. Evaluate adequate separation and other mitigation measures based upon the criteria in Appendix R, NRC staff guidance, and plant licensing bases.

Applicability	**Comments**
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The NMP1 Fire Area Assessments are performed to support transition to a performance based fire protection licensing basis. While performing the primary component circuit analysis for safe shutdown components, it was assumed that electrical coordination exists for all power supplies for each level of electrical power.

Breaker coordination calculation 32-9151404-000, Nine Mile Point Unit 1 - NFPA 805 Coordination Study, demonstrates the existing coordination status for the required common power sources. This calculation identifies any fire protection program breaker coordination issues concerning proper coordination between the supply breaker/fuse and the load breaker/fuses for power sources required for hot shutdown. This document meets the nuclear safety capability requirements of NEI 00-01, Section 3.5.2.4, Figure 3.5.2-6 and NFPA 805, Section 2.4.2.2.2. Any identified issues have been addressed in the NSCA.

Other potential coordination concerns involve associated non-safe shutdown circuits that are not independent of safe shutdown circuits that could also potentially defeat the functions of safe shutdown circuits if not properly protected. These circuits must be associated with both a fire area and a safe shutdown system or component to warrant consideration. These associated circuits are divided into three categories.

- Circuits that share a common power supply with safe shutdown circuits.
- Circuits that share a common enclosure with safe shutdown circuits.
- Circuits for components the spurious operation of which would adversely affect the shutdown process.

The associated circuits are defined in the NMP1 Coordination study which reviews the 4.16 kV, 600 VAC, 480 VAC, 208/120 VAC and 125 VDC power supplies credited for post-fire shutdown.

Proper circuit coordination for power supplies was reviewed, analyzed and addressed in EIR 51-9133191, NSCA.

Reference Document

EIR 51-9133191, NSCA, Section 8.5
HNP RAI 3-18 and RAI 3-19, NRC Request for Additional Information dated August 6, 2009 (ML092170715)
EIR 32-9151404~~-000~~, Nine Mile Point Unit 1 - NFPA 805 Coordination Study

2.4.2.3 Nuclear Safety Equipment and Cable Location

NEI 00-01 Ref	NEI 00-01 Guidance
3.5.2.5 Circuit Failures Due to Common Enclosure Concerns	The common enclosure concern deals with the possibility of causing secondary failures due to fire damage to a circuit either whose isolation device fails to isolate the cable fault or protect the faulted cable from reaching its ignition temperature, or the fire somehow propagates along the cable into adjoining fire areas. The electrical circuit design for most plants provides proper circuit protection in the form of circuit breakers, fuses and other devices that are designed to isolate cable faults before ignition temperature is reached. Adequate electrical circuit protection and cable sizing are included as part of the original plant electrical design maintained as part of the design change process. Proper protection can be verified by review of as-built drawings and change documentation. Review the fire rated barrier and penetration designs that preclude the propagation of fire from one fire area to the next to demonstrate that adequate measures are in place to alleviate fire propagation concerns.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Circuit failures due to common enclosure concerns are addressed by breaker coordination calculation 32-9151404-000, Nine Mile Point Unit 1 - NFPA 805 Coordination Study. This calculation demonstrates the existing coordination status for electrical circuits that could impact safe shutdown concerning proper coordination between the supply breaker/fuse and the load breaker/fuses for power sources required for hot shutdown. This document meets the nuclear safety capability requirements of NEI 00-01, Section 3.5.2.4, Figure 3.5.2-6 and NFPA 805, Section 2.4.2.2.2.

Reference Document

EIR 51-9133191, NSCA, Section 8.5
HNP RAI 3-18 and RAI 3-19, NRC Request for Additional Information dated August 6, 2009 (ML092170715)
EIR 32-9151404~~-000~~, Nine Mile Point Unit 1 - NFPA 805 Coordination Study

2.4.2.4 Fire Area Assessment

Fire Area Assessment. An engineering analysis shall be performed in accordance with the requirements of Section 2.3 for each fire area to determine the effects of fire or fire suppression activities on the ability to achieve the nuclear safety performance criteria of Section 1.5. [See Chapter 4 for methods of achieving these performance criteria (performance-based or deterministic).

NEI 00-01 Ref	NEI 00-01 Guidance
3.4 Fire Area Assessment and Compliance Strategies	By determining the location of each component and cable by fire area and using the cable to equipment relationships described above, the affected safe shutdown equipment in each fire area can be determined. Using the list of affected equipment in each fire area, the impacts to safe shutdown systems, paths and functions can be determined. Based on an assessment of the number and types of these impacts, the required safe shutdown path for each fire area can be determined. The specific impacts to the selected safe shutdown path can be evaluated using the circuit analysis and evaluation criteria contained in Section 3.5 of this document. Knowing which components and systems are performing which safe shutdown functions, the required and important to SSD components can be classified. Once these component classifications have been made the tools available for mitigating the effects of fire induced damage can be selected. Refer to Appendix H for additional guidance on classifying components as either required for hot shutdown or important to safe shutdown. For MSOs the Resolution Methodology outlined in Section 4, Section 5, Appendix B and Appendix G should be applied. Components in each MSO are classified as either required for hot shutdown or important to safe shutdown components using the criteria from Appendix H. Similarly, this classification determines the available tools for mitigating the effects of fire-induced damage to the circuits for these components. Having identified all impacts to the required safe shutdown path in a particular fire area, this section provides guidance on the techniques available for individually mitigating the effects of each of the potential impacts.

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

This paragraph provides introductory information and contains no specific requirements. Discussion is provided in subsequent sub-sections.

Reference Document

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref	NEI 00-01 Guidance
3.4.1 Criteria/Assumptions	The following criteria and assumptions apply when performing "deterministic" fire area compliance assessment to mitigate the consequences of the circuit failures identified in the previous sections for the required safe shutdown path in each fire area.

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

This paragraph provides introductory information and contains no specific requirements. Discussion is provided in subsequent sub-sections.

Reference Document

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref	NEI 00-01 Guidance
3.4.1.1 Assume a Single Fire	Assume only one fire in any single fire area at a time.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Only one fire is assumed to occur in any single fire area at a time.

Reference Document

EIR 51-9133191, NSCA, Section 9.0

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref	NEI 00-01 Guidance
3.4.1.2 Fire Affects All Unprotected Cables and Equipment	Assume that the fire may affect all unprotected cables and equipment within the fire area. This assumes that neither the fire size nor the fire intensity is known. This is conservative and bounds the exposure fire that is postulated in the regulation.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

For a conservative approach which bounds the exposure fire required by the regulations, the analysis assumes a fully involved fire and that all equipment and unprotected cabling within a given fire area are damaged by the fire.

Reference Document

EIR 51-9133191, NSCA, Section 9.0

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref	NEI 00-01 Guidance
3.4.1.3 Address all Cable and Equipment Impacts Affecting the Required Safe Shutdown Path	Address all cable and equipment impacts affecting the required safe shutdown path in the fire area. All potential impacts within the fire area must be addressed. The focus of this section is to determine and assess the potential impacts to the required safe shutdown path selected for achieving post-fire safe shutdown and to assure that the required safe shutdown path for a given fire area is properly protected.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Fire Area Assessments were performed on a Fire Area basis in order to ensure compliance in accordance with the safe shutdown requirements of NFPA 805. The Safe Shutdown System and Component drawings were analyzed for each Fire Area to ensure that a success path is available based upon the postulated equipment and/or cable losses in the area. The potentially affected equipment and cables in each Fire Area were reviewed and impacts on safe shutdown success paths analyzed.

The route and location of all safe shutdown cables were loaded into the safe shutdown database. This data was used to generate Fire Area Component Impact Reports, which identified affected systems and components on a Fire Area basis. The Fire Area Component Impact Reports were used as a means to determine the least impacted safe shutdown path for each fire area.

The Fire Area Analysis methodology assumed multiple fire-induced failures and multiple spurious actuations, based on the cables and components present in the fire area of concern. All postulated cable and component failures were identified and a resolution provided at the component level.

The least impacted safe shutdown success path was analyzed so that mitigating strategies could be developed and documented in the Fire Area Assessment. A success path determination for all safe shutdown functions was performed. Generally the path with the least amount of failures was recovered to demonstrate a success path for safe shutdown. Support systems were reviewed in order to assess the impact on the systems being supported. The credited safe shutdown success path was documented in the fire area compliance assessment.

Reference Document

EIR 51-9133191, NSCA, Section 9.0

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref	NEI 00-01 Guidance
3.4.1.4 Classify Each Cable/Component	Use the criteria from Appendix H to classify each impacted cable/component as either a required or important to SSD cable/component.

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

Using the criteria from Appendix H to classify each impacted cable/component as either a required or important to SSD cable/component was not required to support the transition to NFPA 805. Therefore, cables and components were not classified as "required for safe shutdown" or "important for safe shutdown." The safe shutdown flow paths identify the primary components that are required to meet the safe shutdown performance goals. The safe shutdown cables/components were compiled based on each system's performance and safe shutdown function. These components establish the primary safe shutdown flowpath for system operation. Also included in the safe shutdown flow paths are those cables/components whose spurious operation could impact safe shutdown system operability. Systems, components, and cables identified as necessary for the operation of the safe shutdown system under review are included in the safe shutdown equipment and cables lists and are designated with the same shutdown path as the primary safe shutdown system. The components may involve branch flow paths that must be isolated and remain isolated to assure that flow will not be diverted from the primary flow path. The list of primary components may also include selected mechanical components required to support safe shutdown.

Reference Document

EIR 51-9133191, NSCA, Section 9.0

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref	NEI 00-01 Guidance
3.4.1.5 Manual Actions	Use operator manual actions where appropriate, for cable/component impacts classified as important to SSD cable/components, to achieve and maintain post-fire safe shutdown conditions in accordance with NRC requirements (refer to Appendix E). For additional criteria to be used when determining whether an operator manual action may be used for a flow diversion off of the primary flow path, refer to Appendix H.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

Manual actions performed as prescribed in procedures or otherwise are documented in each Fire Area Assessment (FAA). Included in each FAA was the identification of any required operator actions outside the Main Control Room. The operator actions are those directed by operating procedures, repair procedures, or otherwise identified as necessary during the course of the individual FAA. Actions performed at locations other than primary control stations are identified as recovery actions requiring further review as part of the fire risk evaluations. These actions are identified in the Report of Manual Actions and Report of Procedure Directed Manual Actions included in each FAA.

Reference Document

EIR 51-9133191, NSCA, Section 9.0

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref

3.4.1.6 Repairs

NEI 00-01 Guidance

Where appropriate to achieve and maintain cold shutdown within 72 hours, use repairs to equipment required in support of post-fire shutdown.

Applicability

Applicable

Comments

None

Alignment Statement

Aligns with Intent

Alignment Basis

Repairs ~~which are relied upon~~ to achieve and maintain cold shutdown ~~will be performed as required. Repairs~~ are directed by plant procedures. However, NFPA 805 requires only that the plant be maintained in a safe and stable condition. Nor does NFPA 805 require that the plant achieve cold shutdown in 72 hours. Refer to Section 4.2.1.2 for a description of safe and stable as applied to NMP1. NMP1 demonstrates the ability to maintain for each fire area the fuel in a safe and stable condition with one of four designated shutdown paths.

Reference Document

EIR 51-9133191, NSCA, Sections 2.1, 8.5, and 9.0
Closure of National Fire Protection Association 805 Transition Program Frequently Asked Question Number 08-0054 (ML110140183)

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref

3.4.1.7 Appendix R Compliance Criteria

NEI 00-01 Guidance

For the components on the required safe shutdown path classified as required hot shutdown components as defined in Appendix H, Appendix R compliance requires that one train of systems necessary to achieve and maintain hot shutdown conditions from either the control room or emergency control station(s) is free of fire damage (III.G.1.a). When cables or equipment are within the same fire area outside primary containment and separation does not already exist, provide one of the following means of separation for the required safe shutdown components impacted circuit(s):

- Separation of cables and equipment and associated non-safety circuits of redundant trains within the same fire area by a fire barrier having a 3-hour rating (III.G.2.a)
- Separation of cables and equipment and associated non-safety circuits of redundant trains within the same fire area by a horizontal distance of more than 20 feet with no intervening combustibles or fire hazards. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area (III.G.2.b).
- Enclosure of cable and equipment and associated non-safety circuits of one redundant train within a fire area in a fire barrier having a one-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area (III.G.2.c).

For fire areas inside non-inerted containments, the following additional options are also available:

- Separation of cables and equipment and associated non-safety circuits of redundant trains by a horizontal distance of more than 20 feet with no intervening combustibles or fire hazards (III.G.2.d);
- Installation of fire detectors and an automatic fire suppression system in the fire area (III.G.2.e);
- Separation of cables and equipment and associated non-safety circuits of redundant trains by a noncombustible radiant energy shield (III.G.2.f).

Use exemptions, deviations, LARs and licensing change processes to satisfy the requirements mentioned above and to demonstrate equivalency depending upon the plant's license requirements.

Applicability

Applicable

Comments

None

Alignment Statement

Aligns With Intent

Alignment Basis

Each NMP1 fire area containing safe shutdown equipment or cables was reviewed in a deterministic fashion for the ability to achieve post-fire safe shutdown. The affected shutdown related cables and components in each area were identified and the resultant information used to determine the preferred shutdown path to achieve safe shutdown.

The credited safe shutdown success paths were analyzed and mitigating strategies ~~(procedural actions, repair actions or modification)~~ were developed and documented in the Safe Shutdown Analysis, fire area compliance assessments. The results of the assessments confirm that in the event of a postulated exposure fire, the safe shutdown capability of NMP1 will be maintained such that the fuel remains in a safe and stable condition..

The non-safe shutdown circuits which are not completely independent of safe shutdown circuits are associated circuits. These associated circuits are those circuits that could adversely affect the safe shutdown capability or components. These circuits would be associated with a safe shutdown system or component and analyzed the same as other safe shutdown circuits affected within that fire area.

Reference Document

EIR 51-9133191, NSCA, Sections 5.1, 5.2, and 5.3

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref	NEI 00-01 Guidance
3.4.1.8 Alternate/Backup Equipment Selection	Consider selecting other equipment that can perform the same safe shutdown function as the impacted equipment. In addressing this situation, each equipment impact, including spurious operation, is to be addressed in accordance with regulatory requirements and the NPP's current licensing basis. With respect to MSOs, the criteria in Section 4, Appendix B, Appendix G and Appendix H should be used.
Applicability	**Comments**
Applicable	Consideration of Multiple Spurious Operations is addressed in the NSCA (EIR 51-9133191, Section 8.6).

Alignment Statement

Aligns

Alignment Basis

Component selection was performed for all fire areas in order to populate the database with equipment information required to be analyzed against the requirements of NFPA 805.~~10CFR50, Appendix R.~~ The components selected are documented in the Safe Shutdown Equipment List (SSEL). The objective of the SSEL is to provide a list of analyzed components that are utilized in the NFPA 805 NSCA to demonstrate the fuel can be maintained in safe and stable condition. ~~post-fire safe shutdown analysis to ensure that (1) one success path (structures, systems, and components) necessary to achieve safe shutdown is free of fire damage without crediting plant or system repair capabilities and (2) one success path (structures, systems, and components) necessary to achieve cold shutdown within 72 hours is free of fire damage, or available within 72 hours after crediting plant or system repair capabilities.~~The current SSEL was reviewed against the criteria outlined in NEI 00-01 and considered where additional equipment may need to be included to address multiple spurious operation concerns or other separation concerns.

Consideration of component spurious actuation is not limited to the licensing basis criteria documented in UFSAR Appendix 10B, Section 5.9.4. As part of the transition to a NFPA 805 licensing basis, the criteria used in evaluating spurious actuation of components are those identified in NEI 00-01, Section 4, Identification and Treatment of Multiple Spurious Operations, which envelopes the plant licensing basis as discussed in the UFSAR. MSO component combinations were included in the assessments.

The number of potential spuriously operating valves in a line was not limited by number. The NSCA incorporates equipment identified during the review and the cable selection phase by providing an updated SSEL Report of the safe shutdown primary components and the Safe Shutdown Success Paths. In addition, the NSCA supports incorporation of secondary components into the database that were modeled as a result of the primary component selections.

A success path determination for all safe shutdown functions was performed. Generally the path with the least amount of failures was utilized to demonstrate a success path for safe shutdown. Support systems were reviewed in order to assess the impact on the systems being supported.

Primary and secondary shutdown methodologies have been developed. The primary method employs the use of Emergency Condensers. The secondary method employs the use of ERVs and ECCS equipment. This approach provides for versatility by employing diverse equipment resulting in four potential shutdown success paths.

Reference Document

EIR 51-9133191~~-000~~, NSCA, Section 8.6
HNP RAI 3-14, NRC Request for Additional Information dated August 6, 2009 (ML092170715)
Technical Report on Identification & Classification of the NMP-1 MSO Scenarios Using an Expert Panel - Review of New Scenarios, Rev.1
Closure of National Fire Protection Association 805 Transition Program Frequently Asked Question Number 08-0054 (ML110140183)
UFSAR Appendix 10B, Section 5.9.4

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref	NEI 00-01 Guidance
3.4.1.9 Fluid Density Effects	Consider the effects of the fire on the density of the fluid in instrument tubing and any subsequent effects on instrument readings or signals associated with the protected safe shutdown path in evaluating postfire safe shutdown capability. This can be done systematically or via procedures such as Emergency Operating Procedures.

Applicability	Comments
Applicable	Instrument tubing failure due to a fire is addressed in the NSCA (EIR 51-9133191, Section 1.14).

Alignment Statement

Aligns

Alignment Basis

Instrument sensing lines for level, pressure, flow, etc. that are exposed to a fire are considered to have the potential of causing erratic or unreliable signals or indication, unless a fire hazards analysis demonstrates that this failure is not credible. Fire damage to instrument sensing lines can be as detrimental to the instruments as fire damage is to safe shutdown cables and components. Even though the integrity of the tubing is expected to withstand the fire, the accuracy of the instrument may not be reflected correctly due to the heating of the fluid.

The instrument sensing lines route locations are developed and inputted as design input to the analysis. The input consisted of a list of instrument sensing lines (located outside Containment) including the fire areas and associated routing locations through the plant. This information was entered into the database as cables using fictitious cable numbers, including the route and endpoint identifications.

The analysis treated the tubing like cables and associated it with the instrument. The sensing lines are subject to the same compliance issues and similar analytical techniques as safe shutdown cables. Sensing lines of instruments required for safe shutdown are included within the scope of a fire area assessment. In this manner, the sensing lines are included for consideration along with cables when performing the fire area assessments. If instruments were impacted by the fire, then alternate instruments, not impacted by the fire, would be relied upon for safe shutdown.

Instrument sensing lines were reviewed for susceptibility to physical fire damage that may cause a loss of inventory. Sensing lines for SSEL components are constructed of either stainless steel or carbon steel. Consequently, they are not susceptible to physical damage as the result of a postulated fire.

Reference Document

EIR 51-9133191, NSCA, Sections 5.4 and 8.4
HNP RAI 3-15, NRC Request for Additional Information dated August 6, 2009 (ML092170715)

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref	NEI 00-01 Guidance
3.4.2 Methodology for Fire Area Assessment	Refer to NEI 00-01 Figure 3-5 for a flowchart illustrating the various steps involved in performing a fire area assessment. Use the following methodology to assess the impact to safe shutdown and demonstrate Appendix R compliance

Applicability	Comments
Applicable	None

Alignment Statement

Not Required

Alignment Basis

This paragraph provides introductory information and contains no specific requirements. Discussion is provided in subsequent sub-sections.

Reference Document

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref	NEI 00-01 Guidance
3.4.2.1 Identify the Affected Equipment by Fire Area	Identify the safe shutdown cables, equipment and systems located in each fire area that may be potentially damaged by the fire. Provide this information in a report format. The report may be sorted by fire area and by system in order to understand the impact to each safe shutdown path within each fire area.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The information needed to support the Post Fire Safe Shutdown Analysis is maintained in a safe shutdown database which contains the safe shutdown systems, components, cables, and their associated fire area location. This information is available in report format and can be sorted by fire area, system, train, component, cable, safe shutdown path, or various combinations of each. These reports are used to assess potential damage due to fire in each area of the plant. The database reports provide the same information identified on Attachment 5 of NEI 00-01.

Reference Document

EIR 51-9133191, NSCA, Sections 5.4 and 9.0

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref	NEI 00-01 Guidance
3.4.2.2 Determine the Least Impacted Shutdown Path	Based on a review of the systems, equipment and cables within each fire area, determine which shutdown paths are either unaffected or least impacted by a postulated fire within the fire area. Typically, the safe shutdown path with the least number of cables and equipment in the fire area would be selected as the required safe shutdown path. Consider the circuit failure criteria and the possible mitigating strategies, however, in selecting the required safe shutdown path in a particular fire area. Review support systems as a part of this assessment since their availability will be important to the ability to achieve and maintain safe shutdown. For example, impacts to the electric power distribution system for a particular safe shutdown path could present a major impediment to using a particular path for safe shutdown. By identifying this early in the assessment process, an unnecessary amount of time is not spent assessing impacts to the frontline systems that will require this power to support their operation. Determine which components are required hot shutdown components and which components are important to SSD components using the guidance in Appendix H. Based on an assessment as described above, designate the required safe shutdown path(s) for the fire area. Classify the components on the required safe shutdown path necessary to perform the required safe shutdown functions as required safe shutdown components. Identify all equipment not in the safe shutdown path whose spurious operation or mal-operation could affect the shutdown function. Criteria for classifying these components as required for hot shutdown or as important to SSD is contained in Appendix H. Include the affected cables in the shutdown function list. For each of the safe shutdown cables (located in the fire area) that are part of the required safe shutdown path in the fire area, perform an evaluation to determine the impact of a fire-induced cable failure on the corresponding safe shutdown equipment and, ultimately, on the required safe shutdown path. When evaluating the safe shutdown mode for a particular piece of equipment, it is important to consider the equipment's position for the specific safe shutdown scenario for the full duration of the shutdown scenario. It is possible for a piece of equipment to be in two different states depending on the shutdown scenario or the stage of shutdown within a particular shutdown scenario. Document information related to the normal and shutdown positions of equipment on the safe shutdown equipment list.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The Fire Area Compliance Assessments demonstrate the ability to achieve safe shutdown by ensuring at least one safe shutdown success path is available to accomplish the performance goals identified in NEI 00-01. NEI 00-01, Section 3 was used as guidance in performing the assessments. The elements of the assessments performed for NMP1 reflect the NEI 00-01 guidance as discussed in the following.

Fire Area Assessments were performed on a Fire Area basis in order to ensure compliance in accordance with the requirements of NFPA 805.~~10 CFR 50, Appendix R.~~ The safe shutdown database reports provide the potentially affected equipment and cables in each Fire Area, which were analyzed for impacts on safe shutdown success paths.

The Safe Shutdown Equipment List (SSEL) contains equipment data such as the equipment type, description, safe shutdown path, drawing reference, fire area, fire zone, and room location. Other equipment information would include normal position, hot shutdown position, cold shutdown position, failed air position, failed electrical position, high/low pressure interface concern, and spurious operation concern.

The route and location of all Appendix R cables (located by Fire Area) was used to generate the Fire Area Component Impact Reports, which identified affected systems and components on a Fire Area basis. The Fire Area Component Impact Reports were used as a means to determine the least impacted safe shutdown path for each fire area.

The cable selection task involved identifying all cables associated with the control and operation of a safe shutdown component. These cables were analyzed to determine the impact of fire induced cable failure on the selected equipment. A circuit analysis was performed as part of the scope for selected cables/components, as required, in order to demonstrate that the cable is or is not required so that the analyzed component can be credited to perform its required function for the safe shutdown path.

The Fire Area Analysis methodology identified fire-induced component and cable failures and spurious actuations, based on the cables and components present in the fire area of concern. All postulated cable and component failures were assessed and a resolution provided at the component level.

Once the above was complete, the least impacted safe shutdown success path was identified so that mitigating strategies could be developed and documented in the Fire Area Assessment.

Reference Document

EIR 51-9133191, NSCA, Sections 5.1, 5.2, 5.3, and 5.4

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref	NEI 00-01 Guidance
3.4.2.3 Determine Safe Shutdown Equipment Impacts	Using the circuit analysis and evaluation criteria contained in Section 3.5 of this document, determine the equipment that can impact safe shutdown and that can potentially be impacted by a fire in the fire area, and what those possible impacts are.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The Safe Shutdown Equipment List was developed based on system requirements and other plant impacts. During the identification of the Safe Shutdown Equipment List for component cables, a circuit fault analysis for each component's cables was performed to determine the effects of a fire-induced hot short, open circuit and short-to-ground. The circuits associated with the components operation and whose failure could affect the components operation was considered as required. The fire area analysis assumed multiple fire-induced failures and multiple spurious actuations (MSOs), based on the cables and components present in the fire area of concern. The cable and component failures were evaluated and a resolution and disposition was provided for component and cable impacted in that fire area.

In addition, spurious operating equipment concerns are addressed in the "MSO Expert Panel Report," which consists of the multiple spurious operation review. The purpose of this review is to document the potential Multiple Spurious Operation combinations.

The results of this activity identifies equipment, whose fire-induced spurious operation could result in consequences that may be adverse to both the Fire PRA risk models and meeting the nuclear safety performance criteria of NFPA 805. The equipment identified in this task that could affect the Fire PRA will be integrated into the Fire PRA Equipment list.

Reference Document

EIR 51-9133191, NSCA, Sections 5.0, 8.0, and 9.0
ONS RAI 3-41 and RAI 3-43, NRC Request for Additional Information dated July 30, 2000 (ML102110394)
Technical Report on Identification & Classification of the NMP-1 MSO Scenarios Using an Expert Panel - Review of New Scenarios, Rev.1

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref	NEI 00-01 Guidance
3.4.2.4 Develop a Compliance Strategy or Disposition	The available deterministic methods for mitigating the effects of circuit failures are summarized as follows (see Figure 1-1): Required for Hot Shutdown Components: ▪ Re-design the circuit or component to eliminate the concern. This option will require a revision to the post-fire safe shutdown analysis. ▪ Re-route the cable of concern. This option will require a revision to the post-fire safe shutdown analysis. ▪ Protect the cable in accordance with III.G.2. ▪ Provide a qualified 3-fire rated barrier. ▪ Provide a 1-hour fire rated barrier with automatic suppression and detection. ▪ Provide separation of 20 feet or greater with automatic suppression and detection and demonstrate that there are no intervening combustibles within the 20 foot separation distance. ▪ Perform a cold shutdown repair in accordance with regulatory requirements. ▪ Identify other equipment not affected by the fire capable of performing the same safe shutdown function. ▪ Develop exemptions, deviations, LARs, Generic Letter 86-10 evaluation or fire protection design change evaluations with a licensing change process. Important to Safe Shutdown Components: ▪ Any of the options provided for required for hot shutdown components. ▪ Perform and operator manual action in accordance with Appendix E. ▪ Address using fire modeling or a focused-scope fire PRA using the methods of Section 5 for MSO impacts. [Note: The use of fire modeling will require a review by the Expert Panel and the use of a focused-scope fire PRA will require a LAR.] Additional options are available for non-inerted containments as described in 10 CFR 50 Appendix R section III.G.2.d, e and f.

Applicability	Comments
Applicable	None

Alignment Statement

Aligns

Alignment Basis

The safe shutdown analysis provides a compliance strategy and various deterministic methods used for mitigating the effects of circuit failures. Potential impacts to safe shutdown were addressed by using the path least impacted by the fire to assure at least one success path for safe shutdown. This was accomplished by using a combination of the strategies listed in the guidance and taking credit for any existing features whenever possible.

Circuit failures having the potential to adversely impact the shutdown process were identified as Open Items to be transitioned to the Fire Risk Evaluations.

Reference Document

EIR 51-9133191, NSCA, Section 9.0

2.4.2.4 Fire Area Assessment

NEI 00-01 Ref	NEI 00-01 Guidance
3.4.2.5 Document the Compliance Strategy or Disposition	Assign compliance strategy statements or codes to components or cables to identify the justification or mitigating actions proposed for achieving safe shutdown. The justification should address the cumulative effect of the actions relied upon by the licensee to mitigate a fire in the area. Provide each piece of safe shutdown equipment, equipment not in the path whose spurious operation or mal-operation could affect safe shutdown, and/or cable for the required safe shutdown path with a specific compliance strategy or disposition. Refer to Attachment 6 for an example of a Fire Area Assessment Report documenting each cable disposition.

Applicability | **Comments**

Applicable

Alignment Statement

Aligns

Alignment Basis

For the Safe Shutdown Analysis, success paths were developed and analyzed for each component impacted by a fire in the subject area using disposition codes that represent consistent standardized compliance statements. The compliance statement reflects the credited fire protection features, analysis of credible cable failures, and serves as the basis for achieving safe shutdown conditions for the analyzed fire areas. The disposition codes (i.e., resolution of component hits) and associated statements were entered into the safe shutdown database. The following is a sample of generic disposition codes used for the Fire Area Compliance Assessment:

- Cable protected by rated fire barrier.
- Failure of cable may result in loss of power/control of component.
- Failure of cable may result in loss of indication or erroneous indication.
- Component fails in desired SSD position/mode.
- Series isolation valve(s) available and can be closed.
- Capability to close valve is available from the MCR.
- Component remains in desired SSD position.
- Valve can spuriously open. Series isolation valve remains closed

Reference Document

EIR 51-9133191, NSCA, Section 9.0

REVISIONS TO TRANSITION REPORT ATTACHMENT F

FIRE-INDUCED MULTIPLE SPURIOUS OPERATIONS RESOLUTION

Pages F-6 and F-7 with changes highlighted.

Results of Step 3:

The results of the expert panel were included in Task 7.3.1 (NUREG/CR-6850 Task 2) and Task 7.4 (NUREG/CR-6850 Task 3) within the scope of the NMP1 Fire PRA, and in Task 4.2.2, Table B-3 and Fire Area Analysis within the scope of the NMP1 NSCA. Task 7.3.1 addressed spurious operations, including multiple spurious operations identified in the post-fire safe shutdown analysis, and those that resulted from the expert panel review.

The results of the Fire PRA model update are included in NMP1 Fire PRA Notebook, "Equipment Selection," which includes the following MSO related information:

- Identification and disposition of equipment from the review of MSOs (Table D-1 of the "Equipment Selection" notebook); and
- Fire PRA equipment list, which includes MSO identified components and their associated basic events (Table G-1 of the "Equipment Selection" notebook).

The MSO combination components were also evaluated for inclusion into the NMP1 NSCA. As necessary, components were added to the NSCA Equipment List and Logics, and the appropriate circuit analysis and cable routing were performed.

Step 4 – Evaluate for NFPA 805 Compliance

The MSO combinations included in the NSCA should be evaluated with respect to compliance with the deterministic requirements of NFPA 805, as discussed in Section 4.2.3 of NFPA 805. For those situations in which the MSO combination does not meet the deterministic requirements of NFPA 805 (VFDR), the issue with the components and associated cables should be mitigated by other means (e.g., performance-based approach per Section 4.2.4 of NFPA 805, plant modification, etc.).

The performance-based approach may include the use of feasible and reliable recovery actions. The use of recovery actions to demonstrate the availability of a success path for the nuclear safety performance criteria requires that the additional risk presented by the use of these recovery actions be evaluated (NFPA 805 Section 4.2.4).

Results of Step 4:

The MSO combination components of concern were evaluated as part of the NMP1 NSCA and NPO analyses. For NSCA cases where the pre-transition MSO combination components did not meet the deterministic compliance, the MSO combination components were added to the scope of the fire risk evaluations. The process and results for Fire Risk Evaluations are summarized in Section 4.5 of the Transition Report. MSO scenarios impacting NPO POSs are associated with Key Safety Function (KSF) success paths in the NPO analysis. A fire induced loss of these KSF success paths is addressed through the FAQ 07-0040 resolution process, wherein recommendations are provided to best manage fire risk in pinch point plant areas where KSFs may be impacted by a fire (EIR 51-9171174).

Step 5 - Document Results

The results of the process should be documented. The results should provide a detailed description of the MSO identification, analysis, disposition, and evaluation

results (e.g., references used to identify MSOs; the composition of the expert panel, the expert panel process, and the results of the expert panel process; disposition and evaluation results for each MSO, etc.). High level methodology utilized as part of the transition process should be included in the 10 CFR 50.48(c) License Amendment Request/Transition Report.

Results of Step 5:

The NMP1 Results are documented in:

- "Resolution of Issues Related to Fire-Induced Circuit Failures, Technical Report on Identification & Classification of the NMP1 MSO Scenarios using an Expert Panel"
- NMP1 Fire PRA Notebook, N1-ES-F001, "Equipment Selection (ES)"
- NMP1 Fire PRA Notebook, N1-CS-F001, "Cable Selection, Detailed Circuit Analysis and Route Location (CS)"
- NMP1 Fire PRA Notebook, N1-PRM-F001, "Plant Response Model"
- NMP1 Fire Area Transition – See Attachment C (NEI 04-02 Table B-3) of the Transition Report
- EIR 51-9133191, NMP1 Nuclear Safety Capability Assessment (NSCA) Report
- EIR 51-9137629, NMP1 Non-Power Operations KSF Equipment List
- EIR 51-9171174, NMP1 NFPA 805 Transition- Non-Power Operations Component Pinch Point Analysis

REVISIONS TO TRANSITION REPORT ATTACHMENT G

RECOVERY ACTIONS TRANSITION

Pages G-1 through G-41 with changes highlighted.

G. Recovery Actions Transition

~~35~~ 31 Pages Attached

In accordance with the guidance provided in NEI 04-02, FAQ 07-0030, Revision 5, and RG 1.205, the following methodology was used to determine recovery actions required for compliance (i.e., determining the population of post-transition recovery actions). The methodology consisted of the following steps:

- Step 1: Define the primary control station(s) and determine which pre-transition OMAs are taken at primary control station(s) (Activities that occur in the Main Control Room are not considered pre-transition OMAs). Activities that take place at primary control station(s) or in the Main Control Room are not recovery actions, by definition.
- Step 2: Determine the population of recovery actions that are required to resolve VFDRs (to meet the risk acceptance criteria or maintain a sufficient level of defense-in-depth).
- Step 3: Evaluate the additional risk presented by the use of recovery actions required to demonstrate the availability of a success path.
- Step 4: Evaluate the feasibility of the recovery actions.
- Step 5: Evaluate the reliability of the recovery actions.

An overview of these steps and the results of their implementation are provided below.

Step 1 - Clearly define the primary control station(s) and determine which pre-transition OMAs are taken at primary control station(s)

The first task in the process of determining the post-transition population of recovery actions was to apply the NFPA 805 definition of recovery action and the RG 1.205 definition of primary control station to determine those activities that are taken at primary control station(s).

Results of Step 1:

Based on the definition provided in RG 1.205, and the additional guidance provided in FAQ 07-0030, the following locations are considered as taking place at the primary control station(s):

1. Remote Shutdown Panel 11 is located in Fire Area 7, Fire Zone T2B, Turbine Building Elevation 250'-0".
2. Remote Shutdown Panel 12 is located in Fire Area 5, Fire Zone T4A, Turbine Building Elevation 277'-0".

The remote shutdown panels were approved by the NRC in SER entitled "Subject Modifications and Alternate Safe Shutdown Capabilities to Comply with the Requirements of Appendix R", dated March 3, 1983.

Table G-1 - "Recovery Actions and Activities Occurring at the Primary Control Station(s)" identifies the activities that occur at the primary control station(s). Activities necessary to enable the primary control station(s) are also identified in Table G-1 as primary control station(s) activities. These activities do not require the treatment of additional risk and are compliant with NFPA 805, Section 4.2.3.1.

Note that the Remote Shutdown Panels (RSPs) are primary control station(s) only for a fire in Fire Area 11 for which a MCR evacuation is credited.

Step 2 – Determine the population of recovery actions that are required to resolve VFDRs (to meet the risk or defense-in-depth criteria)

On a fire area basis, all VFDRs were identified in the NEI 04-02 Table B-3 (see Attachment C). Each VFDR not brought into compliance with the deterministic approach was evaluated using the performance-based approach of NFPA 805 Section 4.2.4. The performance-based evaluations resulted in the need for recovery actions to meet the risk acceptance criteria or maintain a sufficient level of defense-in-depth.

Results of Step 2:

The FRE report provides the determination of recovery actions required to resolve VFDRs. These recovery actions are listed in Table G-1, "Recovery Actions and Activities Occurring at the Primary Control Station(s)."

The actions contained in Table G-1 are identified on a fire area basis. Many of the same actions are repeated in different fire areas. To assist in understanding the various types of recovery actions contained in Table G-1, Table 4-1 has been created. Table 4-1 is a list of unique recovery actions only and does not include primary control station actions. It is important to note that not every component listed in the Components column of Table 4-1 is associated with every fire area listed in the Fire Areas of Concern column. The Fire Areas of Concern reflects the aggregate list of fire areas where the type of unique recovery action is credited to support shutdown. It is also important to note that item ~~15~~ 12 in Table 4-1 is a proposed modification identified in Attachment S, specifically Table S-1. The final set of recovery actions is provided in Table G-1 - Recovery Actions and Activities Occurring at the Primary Control Station(s).

Table 4-1: Unique Operator Recovery Actions

No.	Action Description	Components	Fire Areas of Concern
1	Operator determines vital parameters at RSP	LI-36-26, LI-36-28, LI-60-22C, LI-60-23C, PI-201.2-94, PI-201.2-5, PI-36-25, PI-36-27, TI-201-50B, TI-201-51B TI-201.2-521B, TI-201.2-522B, TI-32-02B, TI-32-03B, TI-32-04B, TI-32-05B	1, 2, 5, 10
~~2~~	~~Operate locally to provide cooling water to Shutdown Cooling Pumps~~	~~BV-70-53~~	~~4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15,16A, 16B, 17A, 17B, 19, 20, 21~~
~~3~~	~~Operate locally to maintain cool down rate~~	~~BV-38-04, FCV-38-09, FCV-38-10, FCV-38-11, IV-38-01, IV-38-02, IV-38-13, PMP-38-152~~	~~4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15,16A, 16B, 17A, 17B, 19, 20, 21~~
~~4~~	~~Wiring repaired and component operated at Power Board~~	~~IV-38-01, IV-38-13, PMP-38-149, PMP-38-152~~	~~5, 7, 10, 11~~
2~~5~~	Valve locally throttled to control make-up to the Emergency Condensers	VLV-60-11, VLV-60-12	4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15,16A, 16B, 17A, 17B, 18, 19, 20, 21, 22, 23, 24
3~~6~~	Connect portable charger to charge Batteries	BAT-B11, BAT-B12	5, 6, 7, 9, 10, 11
4~~7~~	Manually isolate to prevent inventory loss	FCV-39-15, FCV-39-16, VLV-05-31, VLV-05-32	5, 6, 9, 10, 11, 18, 22, 23, 24
5~~8~~	Vent air to close valve to prevent inventory loss	IV-01-03, IV-01-04	5, 6, 7, 9, 10, 11, 18, 22, 23, 24
6~~9~~	Vent air to open to establish Emergency Condensers on failure to open	IV-39-05, IV-39-06	5, 10
7~~10~~	Verify tripped for load shedding	PB-BB11, PB-BB12, UPS-UPS162A , UPS-UPS162B, ~~,~~UPS-UPS172A , UPS-UPS172B	5, 6, 7, 9, 10, 11
~~11~~8	Shut down locally for load shedding	PMP-79.1-01, PMP-79.1-07, PMP-79.1-20, PMP-79.1-26	5, 6, 7, 9, 10, 11
9~~12~~	Locally operate to establish decay heat removal through Emergency Condensers	IV-39-07R, IV-39-08R, IV-39-09R, IV-39-10R	10
10~~13~~	Emergency Condenser Level Control Transfer switch to local	LCV-60-17, LCV-60-18	10
~~14~~11	Operate manually to isolate Containment spray on spurious start	VLV-93-13, VLV-93-16	5, 11, 24
12~~15~~	Open NEW Disconnect to load Emergency Diesel Generator to Dead bus (Currently a Damage Repair Procedure action)	Recover Emergency Diesel Generator	5, 7, 9, 10, 11
13~~16~~	Scram control rods by venting the scram air header	BV-113-3091, VLV-113-230	5, 7, 10, 11
14	Locally operate the Fire Water System using the DFP to provide long term Emergency Condenser makeup tank supply	BV-100-68, BV-100-69, PMP-100-02	4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16A, 16B, 17A, 17B, 18, 19, 20, 21, 22, 23, 24

Step 3: Evaluate the Additional Risk of the Use of Recovery Actions

NFPA 805 Section 4.2.3.1 does not allow recovery actions when using the deterministic approach to meet the nuclear safety performance criteria. However, the use of recovery actions is allowed by NFPA 805 using a risk informed, performance-based, approach, provided that the additional risk presented by the recovery actions is evaluated in accordance with NFPA 805 Section 4.2.4.

Results of Step 3:

The set of recovery actions that are necessary to demonstrate the availability of a success path for the nuclear safety performance criteria (see Table G-1) were evaluated for additional risk using the process described in NEI 04-02, FAQ 07-0030, Revision 5, and RG 1.205 and compared against the guidelines of RG 1.174 and RG 1.205. None of the recovery actions were found to have an adverse impact on the Fire PRA. The additional risk of recovery actions is provided in Attachment W.

Step 4: Evaluate the Feasibility of Recovery Actions

Recovery actions were evaluated against the feasibility criteria provided in NEI 04-02, FAQ 07-0030, Revision 5, and RG 1.205. Note that since actions taken at the primary control station are not recovery actions their feasibility is evaluated in accordance with procedures for validation of off normal procedures.

Results of Step 4:

The HRA evaluated the feasibility of recovery actions modeled in the Fire PRA and used to resolve VFDRs identified in the B-3 Table. This includes recovery actions related to AC power, Emergency Diesel Generators, and long-term decay heat removal among others. Feasibility of these recovery actions were evaluated in the HRA against the criteria outlined in NEI 04-02, FAQ 07-0030 Revision 5, and RG 1.205, making extensive use of HEP quantifications.

Recovery actions that are required by the FRE but not addressed in the HRA were evaluated for feasibility using the NEI 04-02, FAQ 07-0030 Revision 5, and RG 1.205 criteria and documented in EIR 51-9156521 entitled, "Recovery Action Review for Nine Mile Point Nuclear Power Station Unit 1 Transition to NFPA 805."

Since actions taken at primary control stations are not recovery actions, no independent feasibility evaluation is required.

Results of the feasibility assessments in the HRA and in the EIR demonstrate that all credited NFPA 805 recovery actions are feasible.

Implementation items resulting from the feasibility evaluation include:

Modify, as needed, the following procedures for recovery actions being evaluated:

- N1-SOP-21.1
- N1-SOP-21.2

Operators will be trained and qualified on the revised procedures.

These items are included as implementation items in Attachment S.

Step 5: Evaluate the Reliability of Recovery Actions

The evaluation of the reliability of recovery actions depends upon its characterization.

- The reliability of recovery actions that were modeled specifically in the Fire PRA were addressed using Fire PRA methods (i.e., HRA).
- The reliability of recovery actions not modeled specifically in the Fire PRA are bounded by the treatment of additional risk associated with the applicable VFDR. In calculating the additional risk of the VFDR, the compliant case recovers the fire-induced failure(s) as if the variant condition no longer exists. The resulting delta risk between the variant and compliant condition bounds any additional risk for the recovery action even if that recovery action were modeled.

Results of Step 5:

The reliability of recovery actions that were modeled specifically in the Fire PRA were addressed using Fire PRA methods. The HRA addresses the reliability of these recovery actions, with consideration taken for various performance shaping factors, including cues and instrumentation, timing, procedures and training, complexity, workload pressure and stress, human-machine interface, environment, special equipment, specific fitness needs, as well as crew communications, staffing, and dynamics. Accordingly, the HRA also evaluates recovery actions depending on whether they correspond or not to main control room abandonment situations.

Recovery actions that are required by the FRE but not addressed in the HRA are evaluated for reliability and documented in EIR 51-9156521 entitled, "Recovery Action Review for Nine Mile Point Nuclear Power Station Unit 1 Transition to NFPA 805."

Since actions taken at primary control stations are not recovery actions, no independent reliability evaluation is required. It should however be noted that a reliability evaluation documented in the HRA was made for those actions taken at PCSs that are credited and modeled in the Fire PRA.

Results of the reliability assessments in the HRA and in EIR 51-9156521 demonstrate that all credited NFPA 805 recovery actions are reliable.

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
1	LI-36-28 TI-201-50B	REACTOR VESSEL LEVEL DRYWELL TEMPERATURE	Operator determines vital parameters from PNL-RSP 11.	VFDR-01-009 VFDR-01-011	RA
1	LI-36-26 TI-201-51B	REACTOR VESSEL LEVEL DRYWELL TEMPERATURE	Operator determines vital parameters from PNL-RSP12.	VFDR-01-009 VFDR-01-011	RA
2	LI-36-28 TI-201-50B TI-201.2-521B	REACTOR VESSEL LEVEL DRYWELL TEMPERATURE TORUS TEMPERATURE	Operator determines vital parameters from PNL-RSP11.	VFDR-02-007 VFDR-02-008 VFDR-02-009	RA
2	LI-36-26 TI-201-51B TI-201.2-522B	REACTOR VESSEL LEVEL DRYWELL TEMPERATURE TORUS TEMPERATURE	Operator determines vital parameters from PNL-RSP12.	VFDR-02-007 VFDR-02-008 VFDR-02-009	RA
4	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE - RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-04-005~~	~~RA~~
4	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-04-009	RA
4	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-04-009	RA
4	~~FCV-38-09~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 11 FLOW CONTROL VALVE~~	~~FCV-38-09 is operated locally to control flow through SDC HX-38-135 to regulate RCS cool down rate.~~	~~VFDR-04-006~~	~~RA~~
4	~~FCV-38-10~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 12 FLOW CONTROL VALVE~~	~~FCV-38-10 is operated locally to control flow through SDC HX-38-132 to regulate RCS cool down rate.~~	~~VFDR-04-007~~	~~RA~~
4	~~FCV-38-11~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 13 FLOW CONTROL VALVE~~	~~FCV-38-11 is operated locally to control flow through SDC HX-38-129 to regulate RCS cool down rate.~~	~~VFDR-04-008~~	~~RA~~
4	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-04-004	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
4	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-04-003	RA
5	BAT-B11	125 VOLT DC STATION BATTERY 11	Portable charger with a generator connected directly to Battery Board PB-BB11 to charge Battery B11.	VFDR-05-035	RA
5	BAT-B12	125 VOLT DC STATION BATTERY NUMBER 12	Portable Charger with Generator connected directly to Battery Board PB-BB12 to charge Battery B12.	VFDR-05-035	RA
5	BKR-(103/1-1) R1032/581	DIESEL GEN 103 OUTPUT BREAKER 103/1-1(R1032/581) to PB-103	Operate disconnect switch locally.	VFDR-05-040 VFDR-05-043	RA
5	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-05-047	RA
5	BV-113-3091 VLV-113-230	BLOCKING VALVE FOR AIR SUPPLY TO SCRAM AIR SYSTEM BALL VALVE - SCRAM VALVE PILOT HEADER VENT	Operator unlocks and closes BV-113-3091. Operator removes the vent pipe cap, unlocks, and opens VLV-113-230 to vent the SCRAM air header to insert the control rods.	VFDR-05-046	RA
~~5~~	~~BV-38-04~~	~~SHUTDOWN COOLING PUMP 12 SUCTION – BLOCKING VALVE~~	~~BV-38-04 is operated locally to align SDC pump PMP-38-152 to the RCS to initiate SDC to provide decay heat removal.~~	~~VFDR-05-044~~	~~RA~~
~~5~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE - RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-05-020~~	~~RA~~
5	EG-EDG103	EMERGENCY GENERATOR – EMERGENCY DIESEL GENERATOR UNIT 103	Operate disconnect switch locally.	VFDR-05-037 VFDR-05-038	RA
~~5~~	~~FCV-38-10~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE – SHUTDOWN COOLING HEAT EXCHANGER 12 FLOW CONTROL VALVE~~	~~FCV-38-10 is operated locally to control flow through SDC HX-38-132 to regulate RCS cool down rate.~~	~~VFDR-05-021~~	~~RA~~

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
5	FCV-39-15	EMERGENCY CONDENSER STEAM LINE DRAIN PRESSURE CONTROL VALVE - FLOW CONTROL VALVE 11 STEAM LINE DRAIN	FCV-39-15 operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 111 & 112 RCS return path drain line.	VFDR-05-003	RA
5	FCV-39-16	EMERGENCY CONDENSER STEAM LINE DRAIN PRESSURE CONTROL VALVE - FLOW CONTROL VALVE 12 STEAM LINE DRAIN	FCV-39-16 operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 121 & 122 RCS return path drain line.	VFDR-05-002	RA
5	IV-01-03	24" AIR OPERATED (ANGLE) ISOLATION VALVE WITH SOLENOID VALVES - MAIN STEAM ISOLATION VALVE 3	Air vented manually at MSIV IV-01-03 to close valve to prevent inventory loss.	VFDR-05-009	RA
5	IV-01-04	24" AIR OPERATED (ANGLE) ISOLATION VALVE WITH SOLENOID VALVES - MAIN STEAM OUT ISOLATION VALVE 4	Air vented manually at MSIV IV-01-04 to close valve to prevent inventory loss.	VFDR-05-009	RA
~~5~~	~~IV-38-01~~	~~MOTOR OPERATED SHUTDOWN COOLING OUTLET INSIDE ISOLATION VALVE~~	~~At PB-167, BKR-(167/D03)52, the valve wiring is repaired and the valve operated to facilitate establishing a SDC suction flow path from the RCS to accomplish decay heat removal.~~	~~VFDR-05-025~~	~~RA~~
~~5~~	~~IV-38-02~~	~~MOTOR OPERATED SHUTDOWN COOLING OUTLET OUTSIDE ISOLATION VALVE~~	~~IV-38-02 is operated locally via the hand wheel to establish a SDC suction flowpath from the RCS to accomplish decay heat removal.~~	~~VFDR-05-045~~	~~RA~~
~~5~~	~~IV-38-13~~	~~REACTOR SHUTDOWN COOLING RETURN ISOLATION VALVE 1~~	~~At PB-167, BKR-(167/G03)52, the valve wiring is repaired and the valve operated to facilitate establishing a SDC discharge flow path to the RCS to accomplish decay heat removal.~~	~~VFDR-05-025~~	~~RA~~
5	IV-39-05	EMERGENCY COOLING LOOP 11 CONDENSATE RETURN AIR OPERATED ISOLATION VALVE (GLOBE)	IV-39-05 is manually opened by venting air from the valve to establish a decay heat removal path using EC's 111 & 112.	VFDR-05-012 VFDR-05-013 VFDR-05-014	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
5	IV-39-06	EMERGENCY COOLING LOOP 12 CONDENSATE RETURN AIR OPERATED ISOLATION VALVE (GLOBE)	IV-39-06 is manually opened by venting air from the valve to establish a decay heat removal path using EC's 121 & 122.	VFDR-05-012 VFDR-05-013 VFDR-05-014	RA
5	PB-BB11	125VDC BATTERY BOARD 11	MG 167 motor BKR-MG167(BB11/E03) verified tripped for battery load shedding to extend battery capability.	VFDR-05-028	RA
5	PB-BB12	125VDC BATTERY BOARD 12	MG 167 motor BKR-MG167(BB12/F03) verified tripped for battery load shedding to extend battery capability.	VFDR-05-028	RA
5	PMP-79.1-01	EMERGENCY DIESEL GENERATOR 102 TURBO LUBE OIL PUMP	PMP-79.1-01 shutdown locally for battery load shedding to extend battery capability.	VFDR-05-028	RA
5	PMP-79.1-07	EMERGENCY DIESEL GENERATOR 102 CIRCULATING LUBE OIL PUMP (6 GALLONS PER MINUTE)	PMP-79.1-07 shutdown locally for battery load shedding to extend battery capability.	VFDR-05-028	RA
5	PMP-79.1-20	EMERGENCY DIESEL GENERATOR 103 TURBO LUBE OIL PUMP	PMP-79.1-20 shutdown locally for battery load shedding to extend battery capability.	VFDR-05-028	RA
5	PMP-79.1-26	EDG 103 CIRCULATING LUBE OIL PUMP (6 GPM)	PMP-79.1-26 shutdown locally for battery load shedding to extend battery capability.	VFDR-05-028	RA
5	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-05-047	RA
5	LI-36-26 PI-36-27	REACTOR VESSEL LEVEL REACTOR VESSEL PRESSURE	Operator determines vital parameters from PNL-RSP12.	VFDR-05-016 VFDR-05-017	RA
5	UPS-UPS162A	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 162A switches HDS-UPS162A-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-05-028	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
5	UPS-UPS162B	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 162B switches HDS-UPS162B-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-05-028	RA
5	UPS-UPS172A	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 172A switches HDS-UPS172A-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-05-028	RA
5	UPS-UPS172B	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 172B switches HDS-UPS172B-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-05-028	RA
5	VLV-05-31	LOOP 11 VENT LINE MANUAL ISOLATION VALVE DOWN STREAM OF 05-01R AND 05-11	VLV-05-31 is operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 111 & 112 RCS steam supply vent line.	VFDR-05-004	RA
5	VLV-05-32	LOOP 12 VENT LINE MANUAL ISOLATION VALVE DOWNSTREAM OF 05-04R AND 05-12	VLV-05-32 is operated locally via the hand wheel to isolate an inventory loss flow path from the EC's 121 & 122 RCS steam supply vent line.	VFDR-05-004	RA
5	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to EC's 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-05-018	RA
5	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-05-018	RA
5	VLV-93-16	12" GATE VALVE - 112 CONTAINMENT SPRAY RAW WATER PUMP DISCHARGE VALVE	VLV-93-16 closed locally via the hand wheel to isolate CTSRW flow to Containment Spray Header #12.	VFDR-05-022	RA
6	BAT-B11	125 VOLT DC STATION BATTERY 11	Portable charger with a generator connected directly to Battery Board PB-BB11 to charge Battery B11.	VFDR-06-017	RA
6	BAT-B12	125 VOLT DC STATION BATTERY 12	Portable Charger with Generator connected directly to Battery Board PB-BB12 to charge Battery B12.	VFDR-06-017	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
~~6~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE – RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HX's.~~	~~VFDR-06-013~~	~~RA~~
~~6~~	~~FCV-38-09~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE – SHUTDOWN COOLING HEAT EXCHANGER 11 FLOW CONTROL VALVE~~	~~FCV-38-09 is operated locally to control flow through SDC HX-38-135 to regulate RCS cool down rate.~~	~~VFDR-06-015~~	~~RA~~
~~6~~	~~FCV-38-11~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE – SHUTDOWN COOLING HEAT EXCHANGER 13 FLOW CONTROL VALVE~~	~~FCV-38-11 is operated locally to control flow through SDC HX-38-129 to regulate RCS cool down rate.~~	~~VFDR-06-014~~	~~RA~~
6	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-06-019	RA
6	FCV-39-15	EMERGENCY CONDENSER STEAM LINE DRAIN PRESSURE CONTROL VALVE - FLOW CONTROL VALVE 11 STEAM LINE DRAIN	FCV-39-15 operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 111 & 112 RCS return path drain line.	VFDR-06-001	RA
6	FCV-39-16	EMERGENCY CONDENSER STEAM LINE DRAIN PRESSURE CONTROL VALVE - FLOW CONTROL VALVE 12 STEAM LINE DRAIN	FCV-39-16 operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 121 & 122 RCS return path drain line.	VFDR-06-002	RA
6	IV-01-03	24" AIR OPERATED (ANGLE) ISOLATION VALVE WITH SOLENOID VALVES - MAIN STEAM ISOLATION VALVE 3	Air vented manually at MSIV IV-01-03 to close valve to prevent inventory loss.	VFDR-06-007	RA
6	IV-01-04	24" AIR OPERATED (ANGLE) ISOLATION VALVE WITH SOLENOID VALVES - MAIN STEAM OUT ISOLATION VALVE 4	Air vented manually at MSIV IV-01-04 to close valve to prevent inventory loss.	VFDR-06-008	RA
~~6~~	~~IV-38-02~~	~~MOTOR OPERATED SHUTDOWN COOLING OUTLET OUTSIDE ISOLATION VALVE~~	~~IV-38-02 is operated locally via the hand wheel to establish a SDC suction flowpath from the RCS to accomplish~~	~~VFDR-06-018~~	~~RA~~

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
			~~decay heat removal.~~		
6	PB-BB11	125VDC BATTERY BOARD 11	MG 167 motor BKR-MG167(BB11/E03) verified tripped for battery load shedding to extend battery capability.	VFDR-06-017	RA
6	PB-BB12	125VDC BATTERY BOARD 12	MG 167 motor BKR-MG167(BB12/F03) verified tripped for battery load shedding to extend battery capability.	VFDR-06-017	RA
6	PMP-79.1-01	EMERGENCY DIESEL GENERATOR 102 TURBO LUBE OIL PUMP	PMP-79.1-01 shutdown locally for battery load shedding to extend battery capability.	VFDR-06-017	RA
6	PMP-79.1-07	EMERGENCY DIESEL GENERATOR 102 CIRCULATING LUBE OIL PUMP (6 GALLONS PER MINUTE)	PMP-79.1-07 shutdown locally for battery load shedding to extend battery capability.	VFDR-06-017	RA
6	PMP-79.1-20	EMERGENCY DIESEL GENERATOR 103 TURBO LUBE OIL PUMP	PMP-79.1-20 shutdown locally for battery load shedding to extend battery capability.	VFDR-06-017	RA
6	PMP-79.1-26	EDG 103 CIRCULATING LUBE OIL PUMP (6 GPM)	PMP-79.1-26 shutdown locally for battery load shedding to extend battery capability.	VFDR-06-017	RA
6	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-06-019	RA
6	UPS-UPS162A	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 162A switches HDS-UPS162A-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-06-017	RA
6	UPS-UPS162B	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 162B switches HDS-UPS162B-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-06-017	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
6	UPS-UPS172A	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 172A switches HDS-UPS172A-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-06-017	RA
6	UPS-UPS172B	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 172B switches HDS-UPS172B-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-06-017	RA
6	VLV-05-31	LOOP 11 VENT LINE MANUAL ISOLATION VALVE DOWN STREAM OF 05-01R AND 05-11	VLV-05-31 is operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 111 & 112 RCS steam supply vent line.	VFDR-06-004 VFDR-06-006	RA
6	VLV-05-32	LOOP 12 VENT LINE MANUAL ISOLATION VALVE DOWNSTREAM OF 05-04R AND 05-12	VLV-05-32 is operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 121 & 122 RCS steam supply vent line.	VFDR-06-003 VFDR-06-005	RA
6	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-06-011	RA
6	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-06-011	RA
7	BAT-B11	125 VOLT DC STATION BATTERY 11	Portable charger with a generator connected directly to Battery Board PB-BB11 to charge Battery B11.	VFDR-07-012	RA
7	BAT-B12	125 VOLT DC STATION BATTERY 12	Portable Charger with Generator connected directly to Battery Board PB-BB12 to charge Battery B12.	VFDR-07-012	RA
7	BV-113-3091 VLV-113-230	BLOCKING VALVE FOR AIR SUPPLY TO SCRAM AIR SYSTEM BALL VALVE - SCRAM VALVE PILOT HEADER VENT	Operator unlocks and closes BV-113-3091. Operator removes the vent pipe cap, unlocks, and opens VLV-113-230 to vent the SCRAM air header to insert the control rods.	VFDR-07-013	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
7	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-07-014	RA
~~7~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE - RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-07-009~~	~~RA~~
~~7~~	~~FCV-38-10~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 12 FLOW CONTROL VALVE~~	~~FCV-38-10 is operated locally to control flow through SDC HX-38-132 to regulate RCS cool down rate.~~	~~VFDR-07-010~~	~~RA~~
7	IV-01-03	24" AIR OPERATED (ANGLE) ISOLATION VALVE WITH SOLENOID VALVES - MAIN STEAM ISOLATION VALVE 3	Air vented manually at MSIV IV-01-03 to close valve to prevent inventory loss.	VFDR-07-001	RA
7	IV-01-04	24" AIR OPERATED (ANGLE) ISOLATION VALVE WITH SOLENOID VALVES - MAIN STEAM OUT ISOLATION VALVE 4	Air vented manually at MSIV IV-01-04 to close valve to prevent inventory loss.	VFDR-07-002	RA
7	PB-BB11	125VDC BATTERY BOARD 11	MG 167 motor BKR-MG167(BB11/E03) verified tripped for battery load shedding to extend battery capability.	VFDR-07-012	RA
7	PB-BB12	125VDC BATTERY BOARD 12	MG 167 motor BKR-MG167(BB12/F03) verified tripped for battery load shedding to extend battery capability.	VFDR-07-012	RA
~~7~~	~~PMP-38-152~~	~~SHUTDOWN COOLING PUMP 12 NU02B~~	~~SDC pump PMP-38-152 is operated at PB-17B, BKR-(17B/006A)52 to establish a SDC flowpath to accomplish decay heat removal.~~	~~VFDR-07-003~~	~~RA~~
7	PMP-79.1-01	EMERGENCY DIESEL GENERATOR 102 TURBO LUBE OIL PUMP	PMP-79.1-01 shutdown locally for battery load shedding to extend battery capability.	VFDR-07-012	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
7	PMP-79.1-07	EMERGENCY DIESEL GENERATOR 102 CIRCULATING LUBE OIL PUMP (6 GALLONS PER MINUTE)	PMP-79.1-07 shutdown locally for battery load shedding to extend battery capability.	VFDR-07-012	RA
7	PMP-79.1-20	EMERGENCY DIESEL GENERATOR 103 TURBO LUBE OIL PUMP	PMP-79.1-20 shutdown locally for battery load shedding to extend battery capability.	VFDR-07-012	RA
7	PMP-79.1-26	EDG 103 CIRCULATING LUBE OIL PUMP (6 GPM)	PMP-79.1-26 shutdown locally for battery load shedding to extend battery capability.	VFDR-07-012	RA
7	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-07-014	RA
7	UPS-UPS162A	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 162A switches HDS-UPS162A-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-07-012	RA
7	UPS-UPS162B	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 162B switches HDS-UPS162B-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-07-012	RA
7	UPS-UPS172A	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 172A switches HDS-UPS172A-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-07-012	RA
7	UPS-UPS172B	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 172B switches HDS-UPS172B-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-07-012	RA
7	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-07-007	RA
7	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-07-007	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
9	BAT-B11	125 VOLT DC STATION BATTERY 11	Portable charger with a generator connected directly to Battery Board PB-BB11 to charge Battery B11.	VFDR-09-018	RA
9	BAT-B12	125 VOLT DC STATION BATTERY 12	Portable Charger with Generator connected directly to Battery Board PB-BB12 to charge Battery B12.	VFDR-09-018	RA
9	BKR-(102/2-1) R1022/571	DIESEL GEN 102 OUTPUT BREAKER 2-1(R1022/571) to PB102	Operate disconnect switch locally to allow for recovery of diesel generator.	VFDR-09-019	RA
9	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-09-022	RA
~~9~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE – RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-09-013~~	~~RA~~
~~9~~	~~FCV-38-09~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 11 FLOW CONTROL VALVE~~	~~FCV-38-09 is operated locally to control flow through SDC HX-38-135 to regulate RCS cool down rate.~~	~~VFDR-09-015~~	~~RA~~
~~9~~	~~FCV-38-11~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 13 FLOW CONTROL VALVE~~	~~FCV-38-11 is operated locally to control flow through SDC HX-38-129 to regulate RCS cool down rate.~~	~~VFDR-09-014~~	~~RA~~
9	FCV-39-15	EMERGENCY CONDENSER STEAM LINE DRAIN PRESSURE CONTROL VALVE - FLOW CONTROL VALVE 11 STEAM LINE DRAIN	FCV-39-15 operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 111 & 112 RCS return path drain line.	VFDR-09-002	RA
9	FCV-39-16	EMERGENCY CONDENSER STEAM LINE DRAIN PRESSURE CONTROL VALVE - FLOW CONTROL VALVE 12 STEAM LINE DRAIN	FCV-39-16 operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 121 & 122 RCS return path drain line.	VFDR-09-003	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
9	IV-01-04	24" AIR OPERATED (ANGLE) ISOLATION VALVE WITH SOLENOID VALVES - MAIN STEAM OUT ISOLATION VALVE 4	Air vented manually at MSIV IV-01-04 to close valve to prevent inventory loss.	VFDR-09-008	RA
~~9~~	~~IV-38-02~~	~~MOTOR OPERATED SHUTDOWN COOLING OUTLET OUTSIDE ISOLATION VALVE~~	~~IV-38-02 is operated locally via the hand wheel to establish a SDC suction flowpath from the RCS to accomplish decay heat removal.~~	~~VFDR-09-021~~	~~RA~~
9	PB-BB11	125VDC BATTERY BOARD 11	MG 167 motor BKR-MG167(BB11/E03) verified tripped for battery load shedding to extend battery capability.	VFDR-09-018	RA
9	PB-BB12	125VDC BATTERY BOARD 12	MG 167 motor BKR-MG167(BB12/F03) verified tripped for battery load shedding to extend battery capability.	VFDR-09-018	RA
9	PMP-79.1-01	EMERGENCY DIESEL GENERATOR 102 TURBO LUBE OIL PUMP	PMP-79.1-01 shutdown locally for battery load shedding to extend battery capability.	VFDR-09-018	RA
9	PMP-79.1-07	EMERGENCY DIESEL GENERATOR 102 CIRCULATING LUBE OIL PUMP (6 GALLONS PER MINUTE)	PMP-79.1-07 shutdown locally for battery load shedding to extend battery capability.	VFDR-09-018	RA
9	PMP-79.1-20	EMERGENCY DIESEL GENERATOR 103 TURBO LUBE OIL PUMP	PMP-79.1-20 shutdown locally for battery load shedding to extend battery capability.	VFDR-09-018	RA
9	PMP-79.1-26	EDG 103 CIRCULATING LUBE OIL PUMP (6 GPM)	PMP-79.1-26 shutdown locally for battery load shedding to extend battery capability.	VFDR-09-018	RA
9	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-09-022	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
9	UPS-UPS162A	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 162A switches HDS-UPS162A-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-09-018	RA
9	UPS-UPS162B	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 162B switches HDS-UPS162B-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-09-018	RA
9	UPS-UPS172A	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 172A switches HDS-UPS172A-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-09-018	RA
9	UPS-UPS172B	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 172B switches HDS-UPS172B-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-09-018	RA
9	VLV-05-31	LOOP 11 VENT LINE MANUAL ISOLATION VALVE DOWN STREAM OF 05-01R AND 05-11	VLV-05-31 is operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 111 & 112 RCS steam supply vent line.	VFDR-09-005 VFDR-09-007	RA
9	VLV-05-32	LOOP 12 VENT LINE MANUAL ISOLATION VALVE DOWNSTREAM OF 05-04R AND 05-12	VLV-05-32 is operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 121 & 122 RCS steam supply vent line.	VFDR-09-004 VFDR-09-006	RA
9	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-09-011	RA
9	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-09-011	RA
10	BAT-B11	125 VOLT DC STATION BATTERY 11	Portable charger with a generator connected directly to Battery Board PB-BB11 to charge Battery B11.	VFDR-10-014	RA
10	BAT-B12	125 VOLT DC STATION BATTERY 12	Portable Charger with Generator connected directly to Battery Board PB-BB12 to charge Battery B12.	VFDR-10-014	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
10	BKR-(102/2-1) R1022/571	DIESEL GEN 102 OUTPUT BREAKER 2-1(R1022/571) TO PB102	Operate disconnect switch locally to allow for recovery of diesel generator.	VFDR-10-021	RA
10	BV-113-3091 VLV-113-230	BLOCKING VALVE FOR AIR SUPPLY TO SCRAM AIR SYSTEM BALL VALVE - SCRAM VALVE PILOT HEADER VENT	Operator unlocks and closes BV-113-3091. Operator removes the vent pipe cap, unlocks, and opens VLV-113-230 to vent the SCRAM air header to insert the control rods.	VFDR-10-028	RA
10	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-10-029	RA
~~10~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE – RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-10-019~~	~~RA~~
~~10~~	~~FCV-38-09~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 11 FLOW CONTROL VALVE~~	~~FCV-38-09 is operated locally to control flow through SDC HX-38-135 to regulate RCS cool down rate.~~	~~VFDR-10-020~~	~~RA~~
10	FCV-39-15	EMERGENCY CONDENSER STEAM LINE DRAIN PRESSURE CONTROL VALVE - FLOW CONTROL VALVE 11 STEAM LINE DRAIN	FCV-39-15 operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 111 & 112 RCS return path drain line.	VFDR-10-007	RA
10	FCV-39-16	EMERGENCY CONDENSER STEAM LINE DRAIN PRESSURE CONTROL VALVE - FLOW CONTROL VALVE 12 STEAM LINE DRAIN	FCV-39-16 operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 121 & 122 RCS return path drain line.	VFDR-10-008	RA
10	IV-01-03	24" AIR OPERATED (ANGLE) ISOLATION VALVE WITH SOLENOID VALVES - MAIN STEAM ISOLATION VALVE 3	Air vented manually at MSIV IV-01-03 to close valve to prevent inventory loss.	VFDR-10-009	RA
10	IV-01-04	24" AIR OPERATED (ANGLE) ISOLATION VALVE WITH SOLENOID VALVES - MAIN STEAM OUT ISOLATION VALVE 4	Air vented manually at MSIV IV-01-04 to close valve to prevent inventory loss.	VFDR-10-010	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
~~10~~	~~IV-38-01~~	~~MOTOR OPERATED SHUTDOWN COOLING OUTLET INSIDE ISOLATION VALVE~~	~~At PB 167, BKR (167/D03)52, the valve wiring is repaired and the valve operated to facilitate establishing a SDC suction flow path from the RCS to accomplish decay heat removal.~~	~~VFDR-10-011~~	~~RA~~
~~10~~	~~IV-38-02~~	~~MOTOR OPERATED SHUTDOWN COOLING OUTLET OUTSIDE ISOLATION VALVE~~	~~IV-38-02 is operated locally via the hand wheel to establish a SDC suction flowpath from the RCS to accomplish decay heat removal.~~	~~VFDR-10-027~~	~~RA~~
10	IV-39-05	EMERGENCY COOLING LOOP 11 CONDENSATE RETURN AIR OPERATED ISOLATION VALVE (GLOBE)	IV-39-05 is manually opened by venting air from the valve to establish a decay heat removal path using ECs 111 & 112.	VFDR-10-012	RA
10	IV-39-06	EMERGENCY COOLING LOOP 12 CONDENSATE RETURN AIR OPERATED ISOLATION VALVE (GLOBE)	IV-39-06 is manually opened by venting air from the valve to establish a decay heat removal path using ECs 121 & 122.	VFDR-10-012	RA
10	IV-39-07R	MOTOR OPERATED LOOP 11 STEAM OUTLET OUTSIDE ISOLATION VALVE 112	IV-39-07R is operated locally via the hand wheel to establish a decay heat removal flowpath using ECs 111 & 112.	VFDR-10-012	RA
10	IV-39-08R	MOTOR OPERATED LOOP 12 STEAM OUTLET OUTSIDE ISOLATION VALVE 122	IV-39-08R is operated locally via the hand wheel to establish a decay heat removal flowpath using ECs 121 & 122.	VFDR-10-012	RA
10	IV-39-09R	MOTOR OPERATED LOOP 11 STEAM OUTLET INSIDE ISOLATION VALVE 111	IV-39-09R is operated locally via the hand wheel to establish a decay heat removal flowpath using ECs 111 & 112.	VFDR-10-012	RA
10	IV-39-10R	MOTOR OPERATED LOOP 12 STEAM OUTLET INSIDE ISOLATION VALVE 121	IV-39-10R is operated locally via the hand wheel to establish a decay heat removal flowpath using ECs 121 & 122.	VFDR-10-012	RA
10	LCV-60-17	EMERGENCY CONDENSER 111 - 112 LEVEL CONTROL VALVE (LOOP 11) - AIR ACTUATED FAIL OPEN	Place EC 111/112 Level Control Transfer switch to Local and verify Auto control by observing "A" on status panel at PNL-RSP11 to override false EC high level signal to support decay heat removal via EC's 111 & 112.	VFDR-10-012	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
10	LCV-60-18	EMERGENCY CONDENSER 121 - 122 LEVEL CONTROL VALVE (LOOP 12) - AIR ACTUATED FAIL OPEN	Place EC 121/122 Level Control Transfer switch to Local and verify Auto control by observing "A" on status panel at PNL-RSP12 to override false EC high level signal to support decay heat removal via EC's 121 & 122.	VFDR-10-012	RA
10	LI-36-28 PI-36-25	REACTOR VESSEL LEVEL REACTOR VESSEL PRESSURE	Operator determines vital parameters from PNL-RSP11.	VFDR-10-013	RA
10	PB-BB11	125VDC BATTERY BOARD 11	MG 167 motor BKR-MG167(BB11/E03) verified tripped for battery load shedding to extend battery capability.	VFDR-10-014	RA
10	PB-BB12	125VDC BATTERY BOARD 12	MG 167 motor BKR-MG167(BB12/F03) verified tripped for battery load shedding to extend battery capability.	VFDR-10-014	RA
~~10~~	~~PMP-38-149~~	~~SHUTDOWN COOLING PUMP 11 NU02A~~	~~SDC PMP-38-149 wiring repaired and operated locally at PB-16B BKR-(16B/009A)52 to establish a SDC flowpath to accomplish decay heat removal.~~	~~VFDR-10-026~~	~~RA~~
10	PMP-79.1-01	EMERGENCY DIESEL GENERATOR 102 TURBO LUBE OIL PUMP	PMP-79.1-01 shutdown locally for battery load shedding to extend battery capability.	VFDR-10-014	RA
10	PMP-79.1-07	EMERGENCY DIESEL GENERATOR 102 CIRCULATING LUBE OIL PUMP (6 GALLONS PER MINUTE)	PMP-79.1-07 shutdown locally for battery load shedding to extend battery capability.	VFDR-10-014	RA
10	PMP-79.1-20	EMERGENCY DIESEL GENERATOR 103 TURBO LUBE OIL PUMP	PMP-79.1-20 shutdown locally for battery load shedding to extend battery capability.	VFDR-10-014	RA
10	PMP-79.1-26	EDG 103 CIRCULATING LUBE OIL PUMP (6 GPM)	PMP-79.1-26 shutdown locally for battery load shedding to extend battery capability.	VFDR-10-014	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
10	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-10-029	RA
10	UPS-UPS162A	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 162A switches HDS-UPS162A-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-10-014	RA
10	UPS-UPS162B	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 162B switches HDS-UPS162B-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-10-014	RA
10	UPS-UPS172A	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 172A switches HDS-UPS172A-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-10-014	RA
10	UPS-UPS172B	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 172B switches HDS-UPS172B-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-10-014	RA
10	VLV-05-31	LOOP 11 VENT LINE MANUAL ISOLATION VALVE DOWN STREAM OF 05-01R AND 05-11	VLV-05-31 is operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 111 & 112 RCS steam supply vent line.	VFDR-10-005 VFDR-10-006	RA
10	VLV-05-32	LOOP 12 VENT LINE MANUAL ISOLATION VALVE DOWNSTREAM OF 05-04R AND 05-12	VLV-05-32 is operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 121 & 122 RCS steam supply vent line.	VFDR-10-003 VFDR-10-004	RA
10	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-10-017	RA
10	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-10-017	RA
11	BAT-B11	125 VOLT DC STATION BATTERY NUMBER 11	Portable charger with a generator connected directly to Battery Board PB-BB11 to charge Battery B11.	VFDR-11-020 VFDR-11-030	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
11	BAT-B12	125 VOLT DC STATION BATTERY NUMBER 12	Portable Charger with Generator connected directly to Battery Board PB-BB12 to charge Battery B12.	VFDR-11-020 VFDR-11-030	RA
11	BV-113-3091 VLV-113-230	BLOCKING VALVE FOR AIR SUPPLY TO SCRAM AIR SYSTEM BALL VALVE - SCRAM VALVE PILOT HEADER VENT	Operator unlocks and closes BV-113-3091. Operator removes the vent pipe cap, unlocks, and opens VLV-113-230 to vent the SCRAM air header to insert the control rods.	VFDR-11-036	RA
11	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-11-037	RA
~~11~~	~~BV-38-04~~	~~SHUTDOWN COOLING PUMP 12 SUCTION - BLOCKING VALVE~~	~~BV-38-04 is operated locally to align SDC pump PMP-38-152 to the RCS to initiate SDC to provide decay heat removal.~~	~~VFDR-11-035~~	~~RA~~
~~11~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE – RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-11-016~~	~~RA~~
11	EMERGENCY COOLING ISOLATION BYPASS SWITCH	EMERGENCY COOLING ISOLATION BYPASS SWITCH	Place Emergency Cooling Isolation Bypass Switch in bypass to enable operation of IV-39-05, IV-39-07, and IV-39-09 from PNL-RSP11.	N/A	PCS
11	EMERGENCY COOLING ISOLATION BYPASS SWITCH	EMERGENCY COOLING ISOLATION BYPASS SWITCH	Place Emergency Cooling Isolation Bypass Switch in bypass to enable operation of IV-39-06, IV-39-08, and IV-39-10 from PNL-RSP12.	N/A	PCS
~~11~~	~~FCV-38-10~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 12 FLOW CONTROL VALVE~~	~~FCV-38-10 is operated locally to control flow through SDC HX-38-132 to regulate RCS cool down rate.~~	~~VFDR-11-035~~	~~RA~~
11	FCV-39-15	EMERGENCY CONDENSER STEAM LINE DRAIN PRESSURE CONTROL VALVE - FLOW CONTROL VALVE 11 STEAM LINE DRAIN	FCV-39-15 operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 111 & 112 RCS return path drain line.	VFDR-11-009	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
11	FCV-39-16	EMERGENCY CONDENSER STEAM LINE DRAIN PRESSURE CONTROL VALVE - FLOW CONTROL VALVE 12 STEAM LINE DRAIN	FCV-39-16 operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 121 & 122 RCS return path drain line.	VFDR-11-010	RA
11	IV-01-03	24" AIR OPERATED (ANGLE) ISOLATION VALVE WITH SOLENOID VALVES - MAIN STEAM ISOLATION VALVE 3	Air vented manually at MSIV IV-01-03 to close valve to prevent inventory loss.	VFDR-11-003	RA
11	IV-01-04	24" AIR OPERATED (ANGLE) ISOLATION VALVE WITH SOLENOID VALVES - MAIN STEAM OUT ISOLATION VALVE 4	Air vented manually at MSIV IV-01-04 to close valve to prevent inventory loss.	VFDR-11-004	RA
~~11~~	~~IV-38-01~~	~~MOTOR OPERATED SHUTDOWN COOLING OUTLET INSIDE ISOLATION VALVE~~	~~At PB 167, BKR (167/D03)52, the valve wiring is repaired and the valve operated to facilitate establishing a SDC suction flow path from the RCS to accomplish decay heat removal.~~	~~VFDR-11-028~~	~~RA~~
~~11~~	~~IV-38-02~~	~~MOTOR OPERATED SHUTDOWN COOLING OUTLET OUTSIDE ISOLATION VALVE~~	~~IV-38-02 is operated locally via the hand wheel to establish a SDC suction flowpath from the RCS to accomplish decay heat removal.~~	~~VFDR-11-035~~	~~RA~~
~~11~~	~~IV-38-13~~	~~REACTOR SHUTDOWN COOLING RETURN ISOLATION VALVE 1~~	~~At PB 167, BKR (167/G03)52, the valve wiring is repaired and the valve operated to facilitate establishing a SDC discharge flow path to the RCS to accomplish decay heat removal.~~	~~VFDR-11-029~~	~~RA~~
11	IV-39-05	EMERGENCY COOLING LOOP 11 CONDENSATE RETURN AIR OPERATED ISOLATION VALVE (GLOBE)	IV-39-05 operated from PNL-RSP11 to establish a decay heat removal path through ECs 111 & 112.	N/A	PCS
11	IV-39-06	EMERGENCY COOLING LOOP 12 CONDENSATE RETURN AIR OPERATED ISOLATION VALVE (GLOBE)	IV-39-06 operated from PNL-RSP12 to establish a decay heat removal path through ECs 121 & 122.	N/A	PCS
11	IV-39-07R	MOTOR OPERATED LOOP 11 STEAM OUTLET OUTSIDE ISOLATION VALVE 112	IV-39-07R operated from PNL-RSP11 to establish a decay heat removal path through ECs 111 & 112.	N/A	PCS

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
11	IV-39-08R	MOTOR OPERATED LOOP 12 STEAM OUTLET OUTSIDE ISOLATION VALVE 122	IV-39-08R operated from PNL-RSP12 to establish a decay heat removal path through ECs 121 & 122.	N/A	PCS
11	IV-39-09R	MOTOR OPERATED LOOP 11 STEAM OUTLET INSIDE ISOLATION VALVE 111	IV-39-09R operated from PNL-RSP11 to establish a decay heat removal path through ECs 111 & 112.	N/A	PCS
11	IV-39-10R	MOTOR OPERATED LOOP 12 STEAM OUTLET INSIDE ISOLATION VALVE 121	IV-39-10R operated from PNL-RSP12 to establish a decay heat removal path through ECs 121 & 122.	N/A	PCS
11	LCV-60-17	EMERGENCY CONDENSER 111 - 112 LEVEL CONTROL VALVE (LOOP 11) - AIR ACTUATED FAIL OPEN	Place EC 111/112 Level Control Transfer switch to Local and verify Auto control by observing "A" on status panel at PNL-RSP11.	N/A	PCS
11	LCV-60-18	EMERGENCY CONDENSER 121 - 122 LEVEL CONTROL VALVE (LOOP 12) - AIR ACTUATED FAIL OPEN	Place EC 121/122 Level Control Transfer switch to Local and verify Auto control by observing "A" on status panel at PNL-RSP12.	N/A	PCS
11	LI-36-26 LI-60-23C PI-201.2-94 PI-36-27 TI-201-51B TI-201.2-522B TI-32-04B TI-32-05B	REACTOR VESSEL LEVEL EMERGENCY CONDENSER 121 & 122 DRYWELL PRESSURE REACTOR VESSEL PRESSURE DRYWELL TEMPERATURE TORUS TEMPERATURE REACTOR COOLANT TEMPERATURE REACTOR COOLANT TEMPERATURE	Operator determines vital parameters from PNL-RSP12.	N/A	PCS
11	MG-MG131	MG SET 131	Place MG Set #131 switch in the TRIP position and confirm CONTROL RODS IN white light lit on PNL-RSP11.	N/A	PCS
11	MG-MG141	MG SET 141	Place MG Set #141 switch in the TRIP position and confirm CONTROL RODS IN white light lit on PNL-RSP12.	N/A	PCS

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
11	PB-BB11	125VDC BATTERY BOARD 11	MG 167 motor BKR-MG167(BB11/E03) verified tripped for battery load shedding to extend battery capability.	VFDR-11-020 VFDR-11-030	RA
11	PB-BB12	125VDC BATTERY BOARD 12	MG 167 motor BKR-MG167(BB12/F03) verified tripped for battery load shedding to extend battery capability.	VFDR-11-020 VFDR-11-030	RA
~~11~~	~~PMP-38-152~~	~~SHUTDOWN COOLING PUMP 12 NU02B~~	~~SDC pump PMP-38-152 is operated at PB-17B, BKR-(17B/006A)52 to establish a SDC flowpath to accomplish decay heat removal.~~	~~VFDR-11-012~~	~~RA~~
11	PMP-79.1-01	EMERGENCY DIESEL GENERATOR 102 TURBO LUBE OIL PUMP	PMP-79.1-01 shutdown locally for battery load shedding to extend battery capability.	VFDR-11-020 VFDR-11-030	RA
11	PMP-79.1-07	EMERGENCY DIESEL GENERATOR 102 CIRCULATING LUBE OIL PUMP (6 GALLONS PER MINUTE)	PMP-79.1-07 shutdown locally for battery load shedding to extend battery capability.	VFDR-11-020 VFDR-11-030	RA
11	PMP-79.1-20	EMERGENCY DIESEL GENERATOR 103 TURBO LUBE OIL PUMP	PMP-79.1-20 shutdown locally for battery load shedding to extend battery capability.	VFDR-11-020 VFDR-11-030	RA
11	PMP-79.1-26	EDG 103 CIRCULATING LUBE OIL PUMP (6 GPM)	PMP-79.1-26 shutdown locally for battery load shedding to extend battery capability.	VFDR-11-020 VFDR-11-030	RA
11	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-11-037	RA
11	UPS-UPS162A	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 162A switches HDS-UPS162A-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-11-020 VFDR-11-030	RA
11	UPS-UPS162B	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 162B switches HDS-UPS162B-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-11-020 VFDR-11-030	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
11	UPS-UPS172A	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 172A switches HDS-UPS172A-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-11-020 VFDR-11-030	RA
11	UPS-UPS172B	POWER SUPPLY - UNINTERRUPTABLE POWER SUPPLY	UPS 172B switches HDS-UPS172B-OS, BS, DC, IS opened for battery load shedding to extend battery capability.	VFDR-11-020 VFDR-11-030	RA
11	VLV-05-31	LOOP 11 VENT LINE MANUAL ISOLATION VALVE DOWN STREAM OF 05-01R AND 05-11	VLV-05-31 is operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 111 & 112 RCS steam supply vent line.	VFDR-11-005 VFDR-11-007	RA
11	VLV-05-32	LOOP 12 VENT LINE MANUAL ISOLATION VALVE DOWNSTREAM OF 05-04R AND 05-12	VLV-05-32 is operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 121 & 122 RCS steam supply vent line.	VFDR-11-006 VFDR-11-008	RA
11	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-11-015	RA
11	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-11-015	RA
11	VLV-93-13	12" GATE VALVE - 121 CONTAINMENT SPRAY RAW WATER PUMP DISCHARGE VALVE	VLV-93-13 closed locally via the hand wheel to isolate CTSRW flow to Containment Spray Header #11.	VFDR-11-018	RA
11	VLV-93-16	12" GATE VALVE - 112 CONTAINMENT SPRAY RAW WATER PUMP DISCHARGE VALVE	VLV-93-16 closed locally via the hand wheel to isolate CTSRW flow to Containment Spray Header #12.	VFDR-11-017	RA
12	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-12-009	RA
~~12~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE – RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-12-005~~	~~RA~~

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
~~12~~	~~FCV-38-09~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 11 FLOW CONTROL VALVE~~	~~FCV-38-09 is operated locally to control flow through SDC HX-38-135 to regulate RCS cool down rate.~~	~~VFDR-12-006~~	~~RA~~
~~12~~	~~FCV-38-10~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 12 FLOW CONTROL VALVE~~	~~FCV-38-10 is operated locally to control flow through SDC HX-38-132 to regulate RCS cool down rate.~~	~~VFDR-12-007~~	~~RA~~
~~12~~	~~FCV-38-11~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 13 FLOW CONTROL VALVE~~	~~FCV-38-11 is operated locally to control flow through SDC HX-38-129 to regulate RCS cool down rate.~~	~~VFDR-12-008~~	~~RA~~
12	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-12-009	RA
12	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-12-004	RA
12	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-12-003	RA
~~13~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE – RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-13-008~~	~~RA~~
~~13~~	~~FCV-38-09~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 11 FLOW CONTROL VALVE~~	~~FCV-38-09 is operated locally to control flow through SDC HX-38-135 to regulate RCS cool down rate.~~	~~VFDR-13-005~~	~~RA~~
~~13~~	~~FCV-38-10~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 12 FLOW CONTROL VALVE~~	~~FCV-38-10 is operated locally to control flow through SDC HX-38-132 to regulate RCS cool down rate.~~	~~VFDR-13-006~~	~~RA~~

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
~~13~~	~~FCV-38-11~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 13 FLOW CONTROL VALVE~~	~~FCV-38-11 is operated locally to control flow through SDC HX-38-129 to regulate RCS cool down rate.~~	~~VFDR-13-007~~	~~RA~~
13	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-13-011	RA
13	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-13-011	RA
13	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-13-004	RA
13	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-13-003	RA
~~14~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE – RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-14-005~~	~~RA~~
~~14~~	~~FCV-38-09~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 11 FLOW CONTROL VALVE~~	~~FCV-38-09 is operated locally to control flow through SDC HX-38-135 to regulate RCS cool down rate.~~	~~VFDR-14-006~~	~~RA~~
~~14~~	~~FCV-38-10~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 12 FLOW CONTROL VALVE~~	~~FCV-38-10 is operated locally to control flow through SDC HX-38-132 to regulate RCS cool down rate.~~	~~VFDR-14-007~~	~~RA~~
~~14~~	~~FCV-38-11~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 13 FLOW CONTROL VALVE~~	~~FCV-38-11 is operated locally to control flow through SDC HX-38-129 to regulate RCS cool down rate.~~	~~VFDR-14-008~~	~~RA~~

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
14	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-14-009	RA
14	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-14-009	RA
14	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-14-004	RA
14	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-14-003	RA
~~15~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE – RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-15-005~~	~~RA~~
~~15~~	~~FCV-38-09~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 11 FLOW CONTROL VALVE~~	~~FCV-38-09 is operated locally to control flow through SDC HX-38-135 to regulate RCS cool down rate.~~	~~VFDR-15-006~~	~~RA~~
~~15~~	~~FCV-38-10~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 12 FLOW CONTROL VALVE~~	~~FCV-38-10 is operated locally to control flow through SDC HX-38-132 to regulate RCS cool down rate.~~	~~VFDR-15-007~~	~~RA~~
~~15~~	~~FCV-38-11~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 13 FLOW CONTROL VALVE~~	~~FCV-38-11 is operated locally to control flow through SDC HX-38-129 to regulate RCS cool down rate.~~	~~VFDR-15-008~~	~~RA~~
15	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-15-009	RA
15	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-15-009	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
15	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to EC's 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-15-004	RA
15	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-15-003	RA
~~16A~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE – RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-16A-007~~	~~RA~~
~~16A~~	~~FCV-38-09~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 11 FLOW CONTROL VALVE~~	~~FCV-38-09 is operated locally to control flow through SDC HX-38-135 to regulate RCS cool down rate.~~	~~VFDR-16A-005~~	~~RA~~
~~16A~~	~~FCV-38-11~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 13 FLOW CONTROL VALVE~~	~~FCV-38-11 is operated locally to control flow through SDC HX-38-129 to regulate RCS cool down rate.~~	~~VFDR-16A-006~~	~~RA~~
~~16A~~	~~IV-38-02~~	~~MOTOR OPERATED SHUTDOWN COOLING OUTLET OUTSIDE ISOLATION VALVE~~	~~IV-38-02 is operated locally via the hand wheel to establish a SDC suction flowpath from the RCS to accomplish decay heat removal.~~	~~VFDR-16A-008~~	~~RA~~
16A	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-16A-009	RA
16A	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-16A-009	RA
16A	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-16A-004	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
16A	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-16A-003	RA
~~16B~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE – RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-16B-006~~	~~RA~~
~~16B~~	~~FCV-38-10~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 12 FLOW CONTROL VALVE~~	~~FCV-38-10 is operated locally to control flow through SDC HX-38-132 to regulate RCS cool down rate.~~	~~VFDR-16B-005~~	~~RA~~
16B	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-16B-007	RA
16B	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-16B-007	RA
16B	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-16B-004	RA
16B	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-16B-003	RA
~~17A~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE – RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HX's.~~	~~VFDR-17A-007~~	~~RA~~
~~17A~~	~~FCV-38-09~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 11 FLOW CONTROL VALVE~~	~~FCV-38-09 is operated locally to control flow through SDC HX-38-135 to regulate RCS cool down rate.~~	~~VFDR-17A-005~~	~~RA~~

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
~~17A~~	~~FCV-38-11~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 13 FLOW CONTROL VALVE~~	~~FCV-38-11 is operated locally to control flow through SDC HX-38-129 to regulate RCS cool down rate.~~	~~VFDR-17A-006~~	~~RA~~
~~17A~~	~~IV-38-02~~	~~MOTOR OPERATED SHUTDOWN COOLING OUTLET OUTSIDE ISOLATION VALVE~~	~~IV-38-02 is operated locally via the hand wheel to establish a SDC suction flowpath from the RCS to accomplish decay heat removal.~~	~~VFDR-17A-008~~	~~RA~~
17A	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-17A-009	RA
17A	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-17A-009	RA
17A	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-17A-004	RA
17A	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-17A-003	RA
~~17B~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE – RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-17B-006~~	~~RA~~
~~17B~~	~~FCV-38-10~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 12 FLOW CONTROL VALVE~~	~~FCV-38-10 is operated locally to control flow through SDC HX-38-132 to regulate RCS cool down rate.~~	~~VFDR-17B-005~~	~~RA~~
17B	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-17B-007	RA
17B	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-17B-007	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
17B	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to EC's 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-17B-004	RA
17B	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to EC's 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-17B-003	RA
18	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-18-011	RA
18	FCV-39-15	EMERGENCY CONDENSER STEAM LINE DRAIN PRESSURE CONTROL VALVE - FLOW CONTROL VALVE 11 STEAM LINE DRAIN	FCV-39-15 operated locally via the hand wheel to isolate an inventory loss flow path from the EC's 111 & 112 RCS return path drain line.	VFDR-18-005	RA
18	FCV-39-16	EMERGENCY CONDENSER STEAM LINE DRAIN PRESSURE CONTROL VALVE - FLOW CONTROL VALVE 12 STEAM LINE DRAIN	FCV-39-16 operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 121 & 122 RCS return path drain line.	VFDR-18-004	RA
18	IV-01-04	24" AIR OPERATED (ANGLE) ISOLATION VALVE WITH SOLENOID VALVES - MAIN STEAM OUT ISOLATION VALVE 4	Air vented manually at MSIV IV-01-04 to close valve to prevent inventory loss.	VFDR-18-002	RA
18	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-18-011	RA
18	VLV-05-31	LOOP 11 VENT LINE MANUAL ISOLATION VALVE DOWN STREAM OF 05-01R AND 05-11	VLV-05-31 is operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 111 & 112 RCS steam supply vent line.	VFDR-18-003	RA
18	VLV-05-32	LOOP 12 VENT LINE MANUAL ISOLATION VALVE DOWNSTREAM OF 05-04R AND 05-12	VLV-05-32 is operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 121 & 122 RCS steam supply vent line.	VFDR-18-003	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
18	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to EC's 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-18-008	RA
18	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to EC's 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-18-008	RA
~~19~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE – RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-19-003~~	~~RA~~
~~19~~	~~FCV-38-09~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 11 FLOW CONTROL VALVE~~	~~FCV-38-09 is operated locally to control flow through SDC HX-38-135 to regulate RCS cool down rate.~~	~~VFDR-19-005~~	~~RA~~
~~19~~	~~FCV-38-11~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 13 FLOW CONTROL VALVE~~	~~FCV-38-11 is operated locally to control flow through SDC HX-38-129 to regulate RCS cool down rate.~~	~~VFDR-19-004~~	~~RA~~
~~19~~	~~IV-38-02~~	~~MOTOR OPERATED SHUTDOWN COOLING OUTLET OUTSIDE ISOLATION VALVE~~	~~IV-38-02 is operated locally via the hand wheel to establish a SDC suction flowpath from the RCS to accomplish decay heat removal.~~	~~VFDR-19-006~~	~~RA~~
19	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-19-007	RA
19	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-19-007	RA
19	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-19-001	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
19	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-19-001	RA
~~20~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE – RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-20-004~~	~~RA~~
~~20~~	~~FCV-38-09~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 11 FLOW CONTROL VALVE~~	~~FCV-38-09 is operated locally to control flow through SDC HX-38-135 to regulate RCS cool down rate.~~	~~VFDR-20-006~~	~~RA~~
~~20~~	~~FCV-38-11~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 13 FLOW CONTROL VALVE~~	~~FCV-38-11 is operated locally to control flow through SDC HX-38-129 to regulate RCS cool down rate.~~	~~VFDR-20-005~~	~~RA~~
~~20~~	~~IV-38-02~~	~~MOTOR OPERATED SHUTDOWN COOLING OUTLET OUTSIDE ISOLATION VALVE~~	~~IV-38-02 is operated locally via the hand wheel to establish a SDC suction flowpath from the RCS to accomplish decay heat removal.~~	~~VFDR-20-001~~	~~RA~~
20	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-20-008	RA
20	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-20-008	RA
20	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-20-002	RA
20	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-20-002	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
~~21~~	~~BV-70-53~~	~~14" AIR OPERATED BLOCKING VALVE – RBCLC INLET VALVE TO SHUTDOWN COOLING SYSTEM~~	~~BV-70-53 is operated locally to provide cooling water to the SDC pumps and a heat sink for the SDC HXs.~~	~~VFDR-21-004~~	~~RA~~
~~21~~	~~FCV-38-09~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 11 FLOW CONTROL VALVE~~	~~FCV-38-09 is operated locally to control flow through SDC HX-38-135 to regulate RCS cool down rate.~~	~~VFDR-21-006~~	~~RA~~
~~21~~	~~FCV-38-11~~	~~8" DIAPHRAGM OPERATED FLOW CONTROL VALVE - SHUTDOWN COOLING HEAT EXCHANGER 13 FLOW CONTROL VALVE~~	~~FCV-38-11 is operated locally to control flow through SDC HX-38-129 to regulate RCS cool down rate.~~	~~VFDR-21-005~~	~~RA~~
~~21~~	~~IV-38-02~~	~~MOTOR OPERATED SHUTDOWN COOLING OUTLET OUTSIDE ISOLATION VALVE~~	~~IV-38-02 is operated locally via the hand wheel to establish a SDC suction flowpath from the RCS to accomplish decay heat removal.~~	~~VFDR-21-001~~	~~RA~~
21	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-21-008	RA
21	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-21-008	RA
21	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to EC's 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-21-002	RA
21	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to EC's 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-21-002	RA
22	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-22-008	RA
22	FCV-39-16	EMERGENCY CONDENSER STEAM LINE DRAIN PRESSURE CONTROL VALVE - FLOW CONTROL VALVE 12 STEAM	FCV-39-16 operated locally via the hand wheel to isolate an inventory loss flow path from the EC's 121 & 122 RCS return path drain line.	VFDR-22-004	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
		LINE DRAIN			
22	IV-01-04	24" AIR OPERATED (ANGLE) ISOLATION VALVE WITH SOLENOID VALVES - MAIN STEAM OUT ISOLATION VALVE 4	Air vented manually at MSIV IV-01-04 to close valve to prevent inventory loss.	VFDR-22-002	RA
22	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-22-008	RA
22	VLV-05-32	LOOP 12 VENT LINE MANUAL ISOLATION VALVE DOWNSTREAM OF 05-04R AND 05-12	VLV-05-32 is operated locally via the hand wheel to isolate an inventory loss flow path from the EC's 121 & 122 RCS steam supply vent line.	VFDR-22-003	RA
22	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-22-007	RA
22	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-22-007	RA
23	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-23-008	RA
23	FCV-39-16	EMERGENCY CONDENSER STEAM LINE DRAIN PRESSURE CONTROL VALVE - FLOW CONTROL VALVE 12 STEAM LINE DRAIN	FCV-39-16 operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 121 & 122 RCS return path drain line.	VFDR-23-003	RA
23	IV-01-04	24" AIR OPERATED (ANGLE) ISOLATION VALVE WITH SOLENOID VALVES - MAIN STEAM OUT ISOLATION VALVE 4	Air vented manually at MSIV IV-01-04 to close valve to prevent inventory loss.	VFDR-23-002	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
23	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-23-008	RA
23	VLV-05-32	LOOP 12 VENT LINE MANUAL ISOLATION VALVE DOWNSTREAM OF 05-04R AND 05-12	VLV-05-32 is operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 121 & 122 RCS steam supply vent line.	VFDR-23-004	RA
23	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-23-006	RA
23	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-23-006	RA
24	BV-100-68 BV-100-69	LOOP 111 & 112 AND LOOP 121 & 122 MANUAL VALVES	BV-100-68 and BV-100-69 are locally opened to periodically refill the Emergency Condenser Makeup tanks.	VFDR-24-007	RA
24	FCV-39-15	EMERGENCY CONDENSER STEAM LINE DRAIN PRESSURE CONTROL VALVE - FLOW CONTROL VALVE 11 STEAM LINE DRAIN	FCV-39-15 operated locally via the hand wheel to isolate an inventory loss flow path from the ECs 111 & 112 RCS return path drain line.	VFDR-24-003	RA
24	IV-01-04	24" AIR OPERATED (ANGLE) ISOLATION VALVE WITH SOLENOID VALVES - MAIN STEAM OUT ISOLATION VALVE 4	Air vented manually at MSIV IV-01-04 to close valve to prevent inventory loss.	VFDR-24-002	RA
24	PMP-100-02	DIESEL DRIVEN VERTICAL TURBINE FIRE PUMP	PMP-100-02 is manually started and run as needed to supply fire water to Emergency Condenser Makeup tanks.	VFDR-24-007	RA
24	VLV-60-11	MAKEUP VALVE TO LOOP 12 EMERGENCY CONDENSERS	VLV-60-11 is locally throttled to control makeup to ECs 121 & 122 to provide a RCS heat sink for decay heat removal.	VFDR-24-004	RA
24	VLV-60-12	MAKEUP VALVE TO LOOP 11 EMERGENCY CONDENSERS	VLV-60-12 is locally throttled to control makeup to ECs 111 & 112 to provide a RCS heat sink for decay heat removal.	VFDR-24-004	RA

Table G-1 Recovery Actions and Activities Occurring at the Primary Control Station(s)

Fire Area	Component	Component Description	Actions	VFDR	RA/PCS
24	VLV-93-13	12" GATE VALVE - 121 CONTAINMENT SPRAY RAW WATER PUMP DISCHARGE VALVE	VLV-93-13 closed locally via the hand wheel to isolate CTSRW flow to Containment Spray Header #11.	VFDR-24-006	RA