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SCE&G®
A SCANA COMPANY

November 15, 2011
RC-11-0149

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Dear Sir / Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION UNIT 1
DOCKET NO. 50-395
OPERATING LICENSE NO. NPF-12
LICENSE AMENDMENT REQUEST – LAR-06-00055
LICENSE AMENDMENT REQUEST TO ADOPT NFPA 805 PERFORMANCE-BASED STANDARD FOR FIRE PROTECTION FOR LIGHT WATER REACTOR ELECTRIC GENERATING PLANTS (2001 EDITION)

Pursuant to 10 CFR 50.90, South Carolina Electric & Gas Company (SCE&G), acting for itself and as agent for South Carolina Public Service Authority, requests an amendment to the Virgil C. Summer Nuclear Station (VCSNS) Unit 1 Facility Operating License No. NFP-12. This LAR requests the Nuclear Regulatory Commission (NRC) review and approval for adoption of a new fire protection licensing basis which complies with the requirements in 10 CFR 50.48(a), 10 CFR 50.48(c), and the guidance in Regulatory Guide (RG) 1.205, Revision 1. The LAR also follows the applicable guidance in Nuclear Energy Institute (NEI) 04-02, Revision 2.

The transition includes the following high level activities: elimination of the Self-Induced Station Blackout (SISBO) methodology; a new Nuclear Safety Capability Assessment (NSCA) to replace the Appendix R safe shutdown analysis; a new Fire Probabilistic Risk Assessment (Fire PRA); a new Non-Power Operations (NPO) assessment; a new Radiological Release assessment; and completion of activities required for transitioning the licensing basis to 10 CFR 50.48(c) as specified in NEI 04-02 and RG 1.205.

The NFPA 805 Task Force, established by NEI to ensure successful implementation of NFPA 805 consistent with RG 1.205, continues to provide the interface between the transitioning plants, the nuclear industry, and the NRC. The Task Force, working with the NRC, developed and maintains the Frequently Asked Questions (FAQ) process for obtaining clarifications to RG 1.205, NEI 04-02, and NFPA 805. Additional information is provided in Section 3.4 of Enclosure 1. Attachment H of Enclosure 1 provides the FAQs to date that have been reviewed and/or used to clarify the guidance listed above. FAQ is an ongoing process that will continue as licensees transition.

Attachments C, D, G, and W of Enclosure 1 transmitted herewith contain sensitive information. When separated from these enclosures, this transmittal document is decontrolled.

A006
NRR

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Enclosure 1 contains the VCSNS Transition Report and its supporting attachments. The Transition Report provides the required technical and regulatory assessments to enable the NRC to complete the review and approval of the new licensing basis. SCE&G considers Attachments C, D, G, and W of the Transition Report to be sensitive information and requests that it be withheld from public disclosure pursuant to 10 CFR 2.390.

The Fire PRA to support the Risk-Informed, Performance-Based (RI-PB) fire risk evaluations per Regulatory Positions 2.2 and 4.3 of RG 1.205 has been completed. The Fire PRA was developed in accordance with ASME/ANS RA-Sa-2009 and the guidance in NUREG/CR-6850/EPRI TR-1011989 and the NFPA FAQs. A peer review was conducted during the period of August 16, 2010 through August 20, 2010, and a follow-on peer review was conducted the week of February 21, 2011. This is further discussed in Section 4.5 of Enclosure 1.

A number of variances were identified during the development of the NFPA 805 Nuclear Safety Capability Assessment and dispositioned using performance-based methods. These methods include fire modeling (NFPA 805, Section 4.2.4.1) and fire risk evaluation (NFPA 805, Section 4.2.4.2) processes. Variances were assessed against the quantitative risk acceptance criteria and maintenance of defense-in-depth, and safety margin criteria were ensured as required by Section 5.3.5 of NEI 04-02 and RG 1.205. The results are summarized in Attachment C of Enclosure 1.

Operator manual actions (OMAs) will be described as “recovery actions” in the new licensing basis. As a result of the elimination of SISBO compliance strategy, only a limited number of pre-transition OMAs were retained and no new recovery actions were added. The remaining recovery and primary control station actions are associated with Control Complex fires, when Control Room evacuation is required. Section 4.2.1.3 and Attachment G of Enclosure 1 discuss the methodology and results associated with treatment of OMAs.

Attachment S of Enclosure 1 contains a list of plant modifications and implementation items to support transitioning to the new fire protection licensing basis.

Enclosure 2 contains the VCSNS List of Regulatory Commitments related to the transition to NFPA 805.

Enclosure 3 contains the VCSNS Operating License and Technical Specification changes related to the transition to NFPA 805.

SCE&G has notified the State of South Carolina in accordance with 10 CFR 50.91.

Upon approval, SCE&G requests implementation of the amendment to occur within 180 days of approval.

If you have any questions or require additional information, please contact Bruce Thompson at (803) 931-5042.

I certify under penalty of perjury that the information contained herein is true and correct.

11-15-2011
Executed on

Thomas D. Gatlin

GAR/TDG/jg

Attachment(s):
Enclosure 1 - Transition Report
Enclosure 2 - List of Commitments
Enclosure 3 - Operating License & Technical Specification Changes

c: Without Attachments Unless Noted

K. B. Marsh
S. A. Byrne
J. B. Archie
N. S. Carns
J. H. Hamilton
R. J. White
W. M. Cherry
V. M. McCree With Attachments
B. C. Gleaves With Attachments
NRC Resident Inspector
K. M. Sutton
S. E. Jenkins With Attachments
P. Ledbetter
NSRC
RTS (CR-06-00055)
File (813.20)
PRSF (RC-11-0149) With Attachments

RC-11-0149

Enclosure 1

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

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

SCE&G®
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Transition Report

November 15, 2011

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Executive Summary

South Carolina Electric & Gas Company (SCE&G) will transition the Virgil C. Summer Nuclear Station (VCSNS) fire protection program and the current licensing basis (CLB) to a new Risk Informed-Performance Based (RI-PB) alternative per 10 CFR 50.48(c), which incorporates by reference NFPA 805. The CLB per 10 CFR 50.48(b) and 10 CFR 50, Appendix R, which has been in place since the early 1980s will be superseded in its entirety.

In 2006, SCE&G elected to adopt NFPA 805. A letter of intent was submitted by SCE&G to the NRC on October 19, 2006 (ML062990453) for VCSNS to adopt NFPA 805 in accordance with 10 CFR 50.48(c). The letter of intent requested three years of enforcement discretion. The NRC responded to SCE&G on January 19, 2007 (ML063520409) and approved an enforcement discretion period from October 19, 2006 to October 19, 2009. On July 16, 2009, SCE&G submitted a request in accordance with COMSECY-08-022 to extend the enforcement discretion to six months past the date of the safety evaluation approving the second pilot plant LAR review. In a letter (ML092920297) dated October 19, 2009, the NRC granted this enforcement discretion extension request. However, due to the large number of LAR submittals expected in June 2011, in a letter (ML1116106160) dated June 10, 2011, the Commission approved the staff's recommendation to publish the Federal Register Notice (FRN) announcing the revision to the Enforcement Policy to extend the enforcement discretion to correspond with a staggered LAR submittal schedule. On June 23, 2011, SCE&G submitted a letter (RC-11-0099) requesting extension of their enforcement discretion and committed to the submittal date of September 30, 2011. In a letter (RC-11-0161) dated September 30, 2011, SCE&G informed the NRC that additional evaluation and clarification was needed to ensure the Transition Report met the completeness expectation, and that the LAR will be submitted by November 17, 2011.

The transition process consisted of a review and update of VCSNS documentation, including the development of a Fire Probabilistic Risk Assessment (Fire PRA) using NUREG/CR 6850 as guidance. This Transition Report summarizes the transition process and results. This Transition Report contains information:

- Required by 10 CFR 50.48(c).
- Recommended by guidance document Nuclear Energy Institute (NEI) 04-02 Revision 2 and appropriate Frequently Asked Questions (FAQs).
- Recommended by guidance document Regulatory Guide 1.205 Revision 1.

Section 4 of the Transition Report provides a summary of compliance with the following NFPA 805 requirements:

- Fundamental Fire Protection Program Elements and Minimum Design Requirements
- Nuclear Safety Performance Criteria, including:
  - Non-Power Operational Modes
  - Fire Risk Evaluations
- Radioactive Release Performance Criteria

- Monitoring Program
- Program Documentation, Configuration Control, and Quality Assurance

Section 5 of the Transition Report provides regulatory evaluations and associated attachments, including:

- Changes to License Condition
- Changes to Technical Specifications, Orders, and Exemptions,
- Determination of No Significant Hazards and evaluation of Environmental Considerations.

The attachments to the Transition Report include detail to support the transition process and results.

Attachment H contains the approved FAQs not yet incorporated into the endorsed revision of NEI 04-02. These FAQs have been reviewed and/or used to clarify the guidance in RG 1.205, NEI 04-02, and the requirements of NFPA 805 and in the preparation of this License Amendment Request.

Acronym List

ΔCDF – Change in CDF

ΔLERF – Change in LERF

AC – Alternating Current

ADAMS – Agencywide Documents Access and Management System

AF – Auxiliary Feedwater

AHJ – Authority Having Jurisdiction

ALARA – As Low As Reasonably Achievable

ANS – American Nuclear Society

APCSB – Auxiliary Power Conversion Systems Branch

ARC – VCSNS Fire Safe Shutdown Compliance Assessment Program

ASI – Alternate Seal Injection

ASME – American Society of Mechanical Engineers

ATWS – Anticipated Transient Without Scram

BTP – Branch Technical Position

CAFTA – Computer Aided Fault Tree Analysis

CBDTM – Cause Based Decision Tree Methodology

CC – Capability Category / Component Cooling

CCDP – Conditional Core Damage Probability

CCF – Common Cause Failure

CCFA – Common Cause Failure Analysis

CCW – Condenser Cooling Water

CDF – Core Damage Frequency

CF – Circuit Failure

CFAST – Consolidated Fire and Smoke Transport Model

CFR – Code of Federal Regulation

CLB – Current Licensing Basis

CREP – Control Room Evacuation Panel

CS – Cable Selection

CST – Condensate Storage Tank

CVCS – Chemical and Volume Control System

DBA – Design Basis Accident

DBD – Design Basis Document

DC – Direct Current

DH – Decay Heat

DID – Defense-in-Depth

DROID – Deterministic Requirement Open Item Description

ECCS – Emergency Core Cooling System

ECR – Engineering Change Request

EDG – Emergency Diesel Generator

EFW – Emergency Feedwater System

EOP – Emergency Operating Procedure

EP – Radiation Emergency Plan

EPP – Emergency Plan Procedure

EPRI – Electric Power Research Institute

ERFBS – Electrical Raceway Fire Barrier System

ES – Equipment Selection

ESFAS – Engineered Safeguards Features Actuation Signals

F&O – Fact and Observation

FAQ – Frequently Asked Question

FDS – Fire Dynamics Simulator

FDT – Fire Dynamic Tool

FEP – Fire Emergency Procedure

Fire PRA – Fire Probabilistic Risk Assessment

FM – Fire Modeling / Factory Mutual

FP – Fire Protection

FPEEE – Fire Protection Engineering Equivalency Evaluation

FPER – Fire Protection Evaluation Report

FPP – Fire Protection Procedure

FQ – Fire Risk Quantification

FRE – Fire Risk Evaluation

FRN – Federal Register Notice

FSAR – Final Safety Analysis Report

FSS – Fire Scenario Selection

GDC – General Design Criterion

HEP – Human Error Probability

HGL – Hot Gas Layer

HLP – Hi-Low Pressure

HLR – High Level Requirement

HRA – Human Reliability Analysis

HRE – Higher Risk Evolution

HSS – High Safety Significant

HVAC – Heating, Ventilation, and Air Conditioning

IC – Inventory Control

IEEE – Institute of Electrical and Electronics Engineers

IGN – Ignition Frequency

INEEL – Idaho National Engineering and Environmental Laboratory

IPE – Individual Plant Examination

ISLOCA – Interfacing-Systems Loss of Coolant Accident

KSF – Key Safety Function

LAR – License Amendment Request

LCC – Total Loss of CCW System

LERF – Large Early Release Frequency

LFS – Limiting Fire Scenario

LOCA – Loss of Coolant Accident

LP – Low Pressure

LPI – Low Pressure Injection

MCC – Motor Control Center

MCR – Main Control Room

MD – Management Directive

MEFS – Maximum Expected Fire Scenario

MSO – Multiple Spurious Operation

MU – Maintenance and Update

NEI 04-02 – NEI 04-02, "Guidance for Implementing a Risk-informed, Performance-based Fire Protection Program Under 10 CFR 50.48(c)"

NEIL – Nuclear Energy Insurance Limited

NFPA 805 – National Fire Protection Association Standard 805

NHT – National Hose Thread

NRC – Nuclear Regulatory Commission

NPO – Non-Power Operations

NSA – Nuclear Safety Assessment

NSCA – Nuclear Safety Capability Assessment

NSEL – Nuclear Safety Equipment List

NSP – Nuclear Safety Performance

OAP – Operations Administrative Procedure

OMA – Operatory Manual Action

OS&Y – Outside Stem & Yoke

OSHA – Occupational Safety and Health Administration

PC-CKS – Electrical Cable and Raceway Management System

PCS – Primary Control Station

PORV – Power Operated Relief Valve

POS – Plant Operational State

PP – Plant Partitioning

PRA – Probabilistic Risk Assessment

PRM – Plant Response Model

P_{sacd} – Probability of Spurious Actuation given Cable Damage

PSV – Pressurizer Safety Valve

PTP – Preventative Test Procedure

PWROG – Pressurized Water Reactor Owners Group

QNS – Quantitative Screening

QSP – Quality Systems Procedure

RAW – Risk Achievement Worth

RA – Recovery Action

RES – NRC Office of Nuclear Regulatory Research

RC – Reactivity Control

RCA – Radioactive Control Area

RCP – Reactor Coolant Pump

RCS – Reactor Coolant System

RHR – Residual Heat Removal

RIS – Regulatory Issues Summary

RG – Regulatory Guide

RI-PB – Risk-Informed, Performance-Based

RIS – Regulatory Issues Summary

RWST – Refueling Water Storage Tank

SAP – Station Administrative Procedure

SBO – Station Blackout

SCE&G – South Carolina Electric & Gas Company

SER – Safety Evaluation Report

SF – Seismic Fire

SG – Steam Generator

SISBO – Self-Induced Station Blackout

SOE – Spurious Operation of Equipment

SP – Specification

SR – Standard Support Requirements (PRA standard reference)

SRP – Standard Review Plan

SSCA – Safe Shutdown Circuit Analysis

SSCs – Structures, Systems, and Components

SSD – Appendix R Safe Shutdown

SSE – Safe Shutdown Earthquake

SSER – Supplemental Safety Evaluation Report

STP – Surveillance Test Procedure

SW – Service Water

TAC – Technical Assignment Control

TD – Turbine-Driven

TH – Thermal Hydraulic

TQP – Training and Qualification Procedure

UFSAR – Updated Final Safety Assessment Report

UL – Underwriters Laboratories

UNC – Uncertainty and Sensitivity

V&V – Verification & Validation

VA – Vital Auxiliaries

VCSNS – Virgil C. Summer Nuclear Station

VFDR – Variance from Deterministic Requirement

WOG – Westinghouse Owners Group

1.0 INTRODUCTION

The Nuclear Regulatory Commission (NRC) has promulgated an alternative rule for fire protection requirements at nuclear power plants, 10 CFR 50.48(c), National Fire Protection Association Standard 805 (NFPA 805), 2001 Edition. South Carolina Electric & Gas Company (SCE&G) is implementing the Nuclear Energy Institute methodology NEI 04-02, Revision 2, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48(c)" (NEI 04-02), to transition Virgil C. Summer Nuclear Station (VCSNS) from its current fire protection licensing basis to the new requirements as outlined in NFPA 805. This report describes the transition methodology utilized and documents how VCSNS complies with the new requirements.

1.1 Background

1.1.1 NFPA 805 – Requirements and Guidance

On July 16, 2004 the NRC amended 10 CFR 50.48, Fire Protection, to add a new subsection, 10 CFR 50.48(c), which establishes new Risk-Informed, Performance-Based (RI-PB) fire protection requirements. 10 CFR 50.48(c) incorporates by reference, with exceptions, the National Fire Protection Association's NFPA 805, Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants – 2001 Edition, as a voluntary alternative to 10 CFR 50.48 Section (b), Appendix R, and Section (f), Decommissioning.

As stated in 10 CFR 50.48(c)(3)(i), any licensee's adoption of a RI-PB program that complies with the rule is voluntary. This rule may be adopted as an acceptable alternative method for complying with either 10 CFR 50.48(b), for plants licensed to operate before January 1, 1979, or the fire protection license conditions for plants licensed to operate after January 1, 1979, or 10 CFR 50.48(f), plants shutdown in accordance with 10 CFR 50.82(a)(1).

NEI developed NEI 04-02 to assist licensees in adopting NFPA 805 and making the transition from their current fire protection licensing basis to one based on NFPA 805. The NRC issued Regulatory Guide (RG) 1.205, Risk-Informed, Performance-Based Fire Protection for Existing Light Water Nuclear Power Plants, which endorses NEI 04-02, with exceptions, in December 2009.[1]

A depiction of the primary document relationships is shown in Figure 1-1:

[1] Where referred to in this document NEI 04-02 is Revision 2 and RG 1.205 is Revision 1.

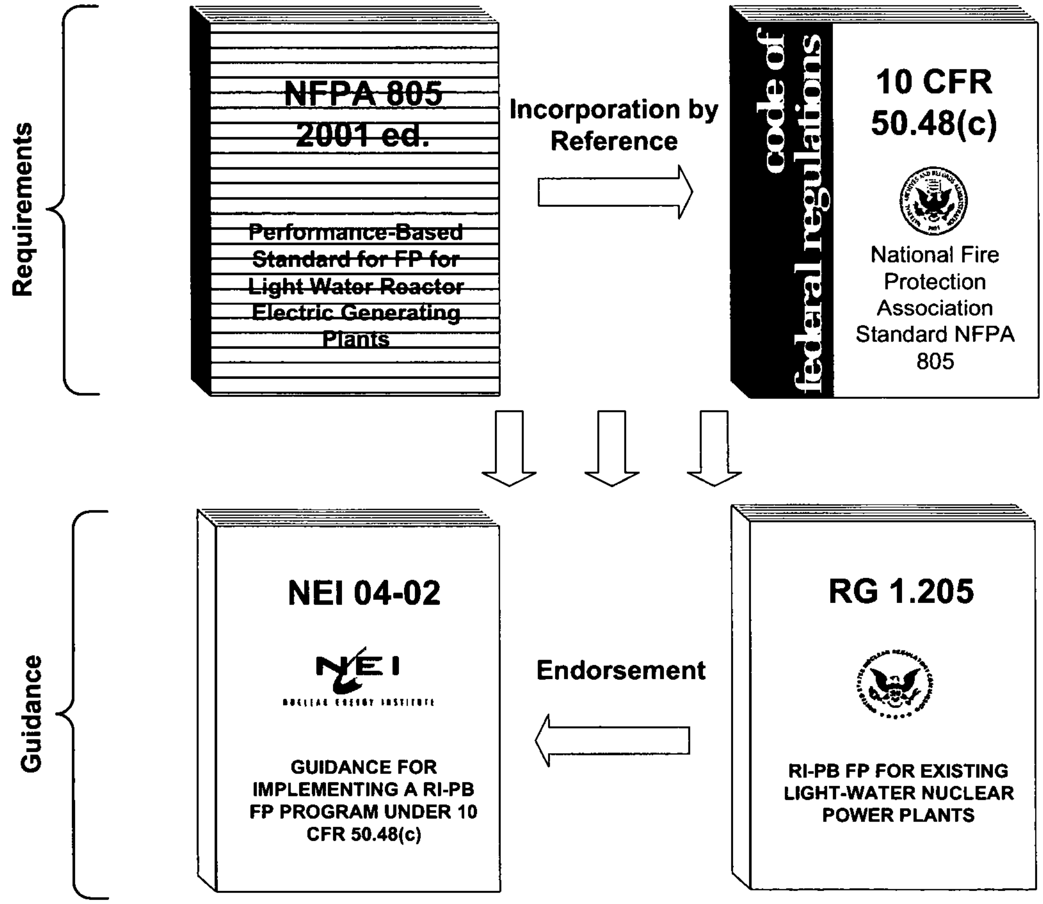

Figure 1-1 NFPA 805 Transition – Implementation Requirements/Guidance

1.1.2 Transition to 10 CFR 50.48(c)

1.1.2.1 Start of Transition

In October 2006, VCSNS decided to transition the fire protection licensing basis to the RI-PB alternative in 10 CFR 50.48(c). SCE&G submitted a letter of intent to the NRC on October 19, 2006 (ML062990453) for VCSNS to adopt NFPA 805 in accordance with 10 CFR 50.48(c).

By letter dated January 19, 2007 (ML063520409), the NRC granted a three year enforcement discretion period from October 19, 2006 to October 19, 2009. In accordance with NRC Enforcement Policy, the enforcement discretion period will continue until the NRC approval of the license amendment request (LAR) is completed. On July 16, 2009 SCE&G submitted a request in accordance with COMSECY-08-022 to extend the enforcement discretion to six months past the date of the safety evaluation approving the second pilot plant LAR review. In a letter (ML092920297) dated October 19, 2009, the NRC granted this enforcement discretion extension request.

The NRC expected approximately 23 LARs by the end of June 2011. As a result, the Commission worked with industry to develop and create a staggered LAR submittal schedule. On April 14, 2011, the NRC held a public meeting, during which the staff and

stakeholders discussed the staggered approach method. In a letter (ML111101452) dated April 20, 2011, the Commission approved the staff's recommendation to develop a staggered submittal and review process for these reviews, and submit a revision to the Enforcement Policy for Commission approval which would propose to extend enforcement discretion to correspond with the new LAR submittal dates. In a letter (ML1116106160) dated June 10, 2011, the Commission approved the staff's recommendation to publish the Federal Register Notice (FRN) announcing the revision to the Enforcement Policy to extend the enforcement discretion to correspond with a staggered LAR submittal schedule. On June 23, 2011, SCE&G submitted a letter (RC-11-0099) requesting extension of their enforcement discretion and committed to the submittal date of September 30, 2011. In a letter (RC-11-0161) dated September 30, 2011, SCE&G informed the NRC that additional evaluation and clarification was needed to ensure the Transition Report met the completeness expectation, and that the LAR will be submitted by November 17, 2011.

1.1.2.2 Transition Process

The transition to NFPA 805 includes the following high level activities:

- Elimination of the Self-Induced Station Blackout (SISBO) methodology for prevention of spurious operations of equipment
- A new Nuclear Safety Capability Assessment (NSCA) to replace the Appendix R safe shutdown analysis
- A new Fire Probabilistic Risk Assessment (Fire PRA) using NUREG/CR 6850, EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities, as guidance and a revision to the Internal Events PRAs to support the Fire PRA
- A new Non-Power Operations (NPO) assessment
- A new Radiological Release assessment
- Completion of activities required to transition the pre-transition Licensing Basis to 10 CFR 50.48(c) as specified in NEI 04-02 and RG 1.205

1.2 Purpose

The purpose of the Transition Report is as follows:

1) Describe the process implemented to transition the current fire protection program to compliance with the additional requirements of 10 CFR 50.48(c);
2) Summarize the results of the transition process;
3) Explain the bases for conclusions that the fire protection program complies with 10 CFR 50.48(c) requirements;
4) Describe the new fire protection licensing basis; and
5) Describe the configuration management processes used to manage post-transition changes to the station and the Fire Protection Program, and resulting impact on the Licensing Basis.

2.0 OVERVIEW OF EXISTING FIRE PROTECTION PROGRAM

2.1 Current Fire Protection Licensing Basis

Virgil C. Summer Nuclear Station was licensed to operate on August 6, 1982. As a result, the VCSNS fire protection program is based on compliance with 10 CFR 50.48(a), 10 CFR 50.48(b), and the following License Condition:

South Carolina Electric & Gas Company's Virgil C. Summer Nuclear Station license condition 2.c (18) states:

> *Fire Protection System (Section 9.5.1 SSER 4)*
>
> *Virgil C. Summer Nuclear Station shall implement and maintain in effect all provisions of the approved fire protection program as described in the Final Safety Analysis Report for the facility, and as approved in the Safety Evaluation Report (SER) dated February 1981 (and Supplements dated January 1982 and August 1982) and Safety Evaluations dated May 22, 1986, November 26, 1986, and July 27, 1987 subject to the following provisions:*
>
> *The licensee may make changes to the approved fire protection program without prior approval of the Commission only if those changes would not adversely affect the ability to achieve and maintain safe shutdown in the event of fire.*

2.2 NRC Acceptance of the Fire Protection Licensing Basis

In a letter dated July 25, 1978, the NRC transmitted 21 questions concerning the fire protection evaluation to SCE&G. Responses to these questions were incorporated into the Updated Fire Protection Evaluation Report (FPER) by Revision 2, dated November 30, 1978. Subsequently, the NRC forwarded a second set of 20 questions in a letter dated October 22, 1979. Of particular importance was question 1 of this set which requested that SCE&G demonstrate the capability of the Virgil C. Summer Nuclear Station to achieve safe shutdown for a fire anywhere in the plant including those locations which would require control room evacuation. Responses to these questions were incorporated into this report by Revisions 4, 5, and 6, dated December 20, 1979, January 1, 1980, and May 15, 1980, respectively.

The NRC reported the results of their evaluation of the original report and the responses to these questions in the original Safety Evaluation Report (SER), dated February 1981, and in Supplemental Safety Evaluation Reports (SSER) 3 and 4, dated January and August 1982, respectively.

During the preparation of the plant license, SCE&G also consented to item 2.c (18) of the operating license which commits SCE&G to maintain the plant fire protection program in accordance with Section III.G., III.J., and III.O. of Appendix R to 10 CFR 50. This action was based on the analysis performed in response to the various questions and on the NRC conclusions in the SER and SSERs.

The following accepted deviations previously granted by the NRC in SSER #3 (NUREG-0717, January 1982), including their corresponding Licensing Action ID number, are:

1) Lack of automatic suppression in the Control Room in Fire Area CB-17 (LA-CB17-01).

2) Twenty-foot separation not maintained between HVAC chill water pumps in Fire Area IB-07 (LA-IB07-01).
3) Twenty-foot separation not maintained between redundant CC pumps in Fire Area IB-25 (LA-IB25-01).
4) Lack of automatic suppression in the discharge valve rooms and fire detection only in room 25-03 (LA-SWPH05-01).
5) Substantial bullet-proof doors used in lieu of three-hour rated doors in various fire areas (LA-FEAT-04).
6) Back-to-back one and a half-hour rated fire dampers used in lieu of three-hour rated fire dampers in various fire areas (LA-FEAT-05).

The following accepted deviations previously granted by the NRC in SSER # 4 (NUREG-0717, August 1982), including their corresponding Licensing Action ID numbers, are:

1) Lack of automatic suppression in Auxiliary Building rooms AB01.01.03 85-01, AB01.07 88-25, AB01.08.02 97-02, AB01.04 00-02, AB01.09, AB01.10 12-11 North, AB01.18.01 36-18, and AB01.30 85-01 and Intermediate Building rooms IB10 23-02, IB11 26-01, IB12 26-02, IB16 51-01, IB17 51-02, IB19 51-03, IB24 36-03B, and IB25.06.01 PA 36-02 (LA-AB01-02, LA-IB10-01, LA-IB11-01, LA-IB12-01, LA-IB16-01, LA-IB17-01, LA-IB19-01, LA-IB24-01 & LA-IB25-05).
2) Lack of automatic fire detection in the areas in Table 9-1 under the column designated 'Deviation Granted by the Staff' (LA-YD01-01 & LA-YD02-01).

The following accepted deviation previously granted by the NRC in a Letter to SCE&G, October 1983, including its corresponding Licensing Action ID number, is:

1) Lack of full automatic suppression in Auxiliary Building rooms AB01.21 (LA-AB01-03).

The following accepted deviations/modification previously granted by the NRC in a Letter to SCE&G, May 22, 1986, V.C. Summer Nuclear Station – Appendix R Reanalysis, including their corresponding Licensing Action ID numbers, are:

1) One-hour rate fire barrier not maintained in Fire Area CB-12 (LA-CB12-01).
2) Radiant energy shield used in lieu of a one-hour rated fire barrier in Fire Area IB-25 (LA-IB25-03).
3) Modification - Eight-hour battery backed emergency lighting not maintained in Fire Area YD-02 (LA-YD02-02).

The following accepted deviations previously granted by the NRC in a Letter to SCE&G, November 26, 1986, V.C. Summer Nuclear Station – Appendix R Reanalysis, including their corresponding Licensing Action ID numbers, are:

1) Three-hour rated fire barrier not maintained between T-hot and T-cold redundant instrument power in Fire Area IB-03 (LA-IB03-01).
2) Three-hour rated fire barrier not maintained between T-hot and T-cold redundant instrument power in Fire Area IB-04 (LA-IB04-01).

3) Three-hour rated fire barrier not maintained between T-hot and T-cold redundant instrument power in Fire Area IB-25 (LA-IB25-04).
4) Three-hour rated fire barrier not maintained between T-hot and T-cold redundant instrument power in Fire Area RB-01 (LA-RB01-01).

The following accepted deviations previously granted by the NRC in a Letter to SCE&G, July 27, 1987, V.C. Summer Nuclear Station – Appendix R Reanalysis, including their corresponding Licensing Action ID numbers, are:

1) Twenty-foot separation not maintained between chemical volume control cables in Fire Area AB-01 (LA-AB01-01).
2) Three-hour rated fire barrier not maintained between service water system cables in Fire Area MH-02 (LA-MH02-01).
3) One-hour rated fire barrier not maintained between service water booster pump equipment and cables in Fire Area IB-25 (LA-IB25-02).

The following accepted deviations previously granted by the NRC in a Letter to SCE&G, October 10, 1997, Deviation from 10 CFR Part 50. Appendix R, Section III.G. Fire Protection of Safe Shutdown Capability for Virgil C. Summer Nuclear Station, including their corresponding Licensing Action ID numbers, are:

1) Use of one-hour rated Rockbestos Firezone R fire resistant cables in lieu of one-hour rated wrap (LA-CB02-01).
2) Use of one-hour rated Rockbestos Firezone R fire resistant cables in Cable Tray 3088 in lieu of one-hour rated fire barrier (LA-IB25-06).

3.0 TRANSITION PROCESS

3.1 Background

Section 4.0 of NEI 04-02 describes the process for transitioning from compliance with the current fire protection licensing basis to the new requirements of 10 CFR 50.48(c). NEI 04-02 contains the following steps:

- Licensee determination to transition the licensing basis and devote the necessary resources to it;
- Submit a Letter of Intent to the NRC stating the licensee's intention to transition the licensing basis in accordance with a tentative schedule;
- Conduct the transition process to determine the extent to which the current fire protection licensing basis supports compliance with the new requirements and the extent to which additional analyses, plant and program changes, and alternative methods and analytical approaches are needed;
- Submit a LAR;
- Complete transition activities that can be completed prior to the receipt of the License Amendment;
- Receive a Safety Evaluation; and
- Complete implementation of the new licensing basis, including completion of modifications identified in Attachment S.

3.2 NFPA 805 Process

Section 2.2 of NFPA 805 establishes the general process for demonstrating compliance with NFPA 805. This process is illustrated in Figure 3-1. It shows that except for the fundamental fire protection requirements, compliance can be achieved on a fire area basis either by deterministic or RI-PB methods. Consistent with the guidance in NEI 04-02, VCSNS has implemented the NFPA 805 Section 2.2 process by first determining the extent to which its current fire protection program and plant design supports findings of deterministic compliance with the requirements in NFPA 805. RI-PB methods are being applied selectively to the requirements for which deterministic compliance could not be shown.

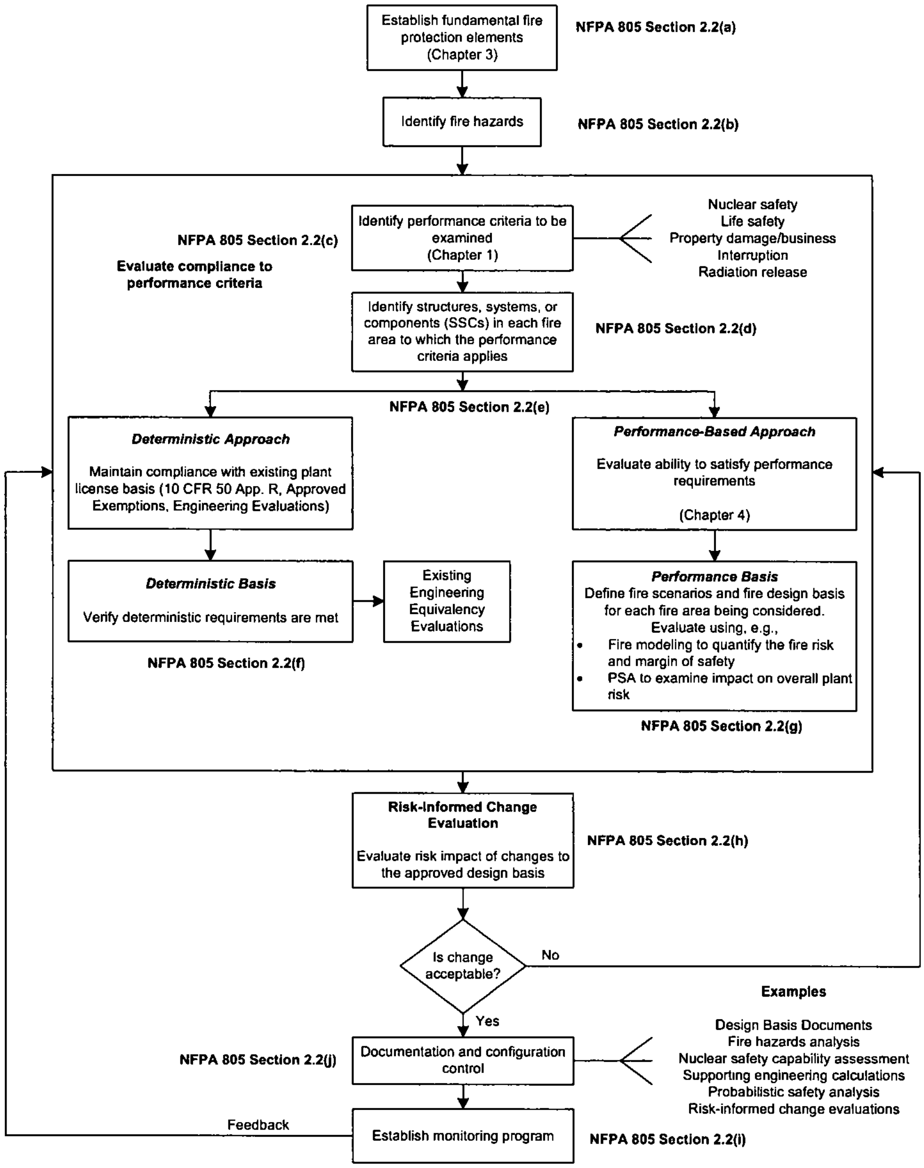

Figure 3-1 NFPA 805 Process [NEI 04-02 Figure 3-1 based on Figure 2-2 of NFPA 805][2]

3.3 NEI 04-02 – NFPA 805 Transition Process

NFPA 805 contains technical processes and requirements for a RI-PB fire protection program. NEI 04-02 was developed to provide guidance on the overall process (programmatic, technical, and licensing) for transitioning from a traditional fire protection licensing basis to a new RI-PB method based upon NFPA 805.

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[2] Note: 10 CFR 50.48(c) does not incorporate by reference Life Safety and Plant Damage/Business Interruption goals, objectives and criteria. See 10 CFR 50.48(c) for specific exceptions to the incorporation by reference of NFPA 805.

Section 4.0 of NEI 04-02 describes the detailed process for assessing a fire protection program for compliance with NFPA 805, as shown in Figure 3-2.

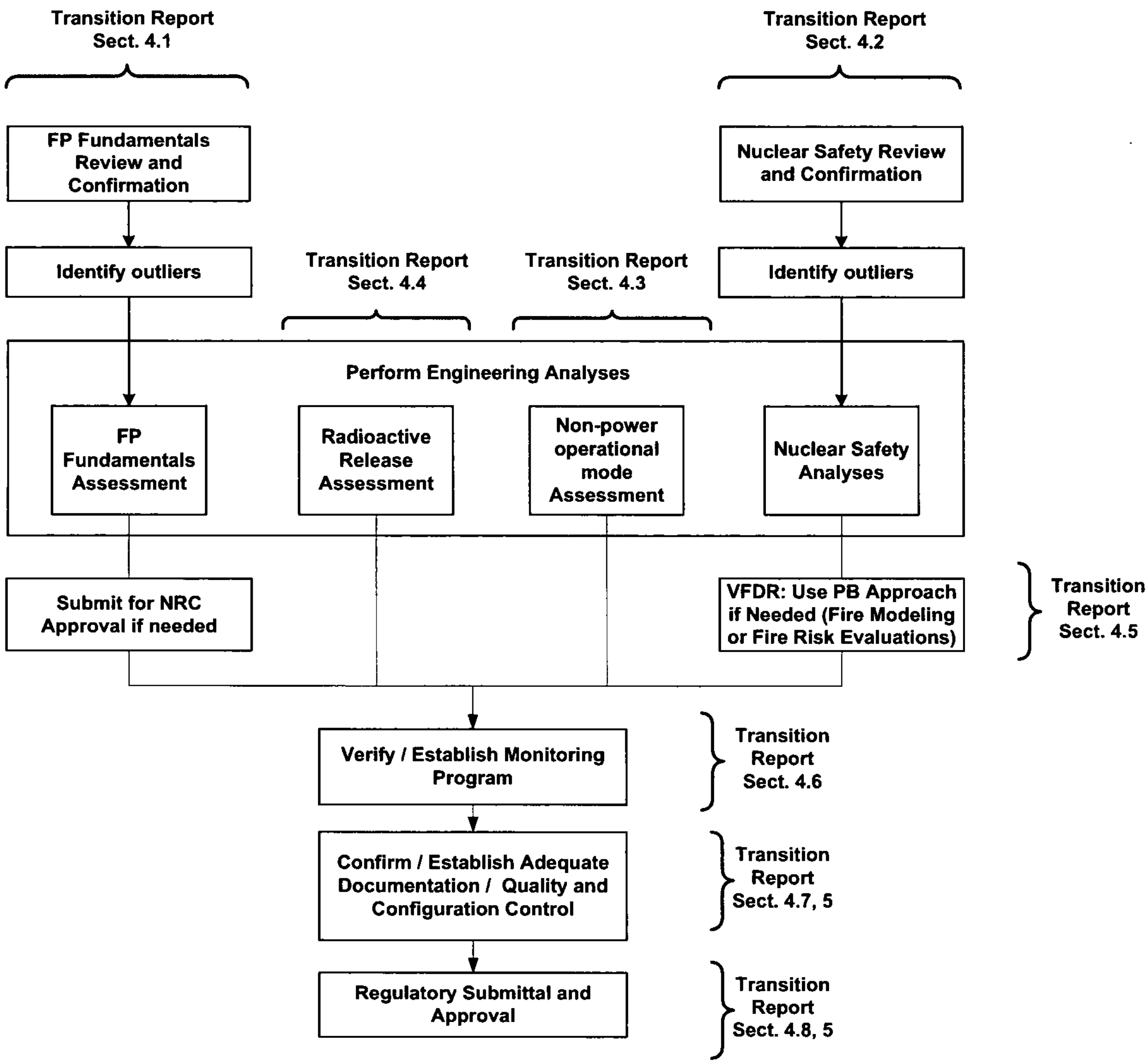

Figure 3-2 Transition Process (Simplified)
[based on NEI 04-02 Figure 4-1 and modified per the VCSNS process]

3.4 NFPA 805 Frequently Asked Questions (FAQs)

The NRC has worked with NEI and two Pilot Plants (Oconee Nuclear Station and Harris Nuclear Plant) to define the licensing process for transitioning to a new licensing basis under 10 CFR 50.48(c) and NFPA 805. Both the NRC and the industry recognized the need for additional clarifications to the guidance provided in RG 1.205, NEI 04-02, and the requirements of NFPA 805. The NFPA 805 FAQ process was jointly developed by NEI and NRC to facilitate timely clarifications of NRC positions. This process is described in a letter from the NRC dated July 12, 2006, to NEI (ML061660105) and in

Regulatory Issues Summary (RIS) 2007-19, Process for Communicating Clarifications of Staff Positions Provided in RG 1.205 Concerning Issues Identified during the Pilot Application of NFPA Standard 805, dated August 20, 2007 (ML071590227).

Under the FAQ Process, transition issues are submitted to the NEI NFPA 805 Task Force for review, and subsequently presented to the NRC during public FAQ meetings. Once the NEI NFPA 805 Task Force and NRC reach agreement, the NRC issues a closure memorandum to indicate that the FAQ is acceptable. NEI 04-02 will be revised to incorporate the approved FAQs. This is an on-going revision process that will continue through the transition of NFPA 805 non-pilot plants. Final closure of the FAQs will occur when future revisions of RG 1.205, endorsing the related revisions of NEI 04-02, are approved by the NRC. It is expected that additional FAQs will be written and existing FAQs will be revised as plants continue NFPA 805 transition after NRC approval of the Pilot Plant Safety Evaluations.

Attachment H contains the list of approved FAQs not yet incorporated into the endorsed revision of NEI 04-02. These FAQs have been reviewed and/or used to clarify the guidance in RG 1.205, NEI 04-02, and the requirements of NFPA 805 and in the preparation of this LAR.

4.0 COMPLIANCE WITH NFPA 805 REQUIREMENTS

4.1 Fundamental Fire Protection Program and Design Elements

The Fundamental Fire Protection Program and Design Elements are established in Chapter 3 of NFPA 805. Section 4.3.1 of NEI 04-02 provides an industry guideline and systematic process for determining the extent to which the pre-transition licensing basis and plant configuration meets these criteria and for identifying the fire protection program changes that would be necessary for compliance with NFPA 805. SCE&G has developed the Fire Protection Program compliance review with the basic guidance, process and criteria promulgated within these documents.

4.1.1 Overview of Evaluation Process

The comparison of the VCSNS Fire Protection Program to the requirements of NFPA 805 was performed and documented in design calculations that were developed in accordance with the configuration control and quality inherent in SCE&G Design Engineering and as indicated in Section 2.7 of NFPA 805. The NFPA 805 Chapter 3 Code Compliance Document used the guidance contained in NEI 04-02, Section 4.3.1 and Appendix B-1 to develop the documentation package(s) (Reference Figure 4-1).

In addition to NFPA 805, Chapter 3 [10 CFR 50.48(c)], applicable codes and/or standards (codes of record) that may have been utilized as design input and are essential to the functional performance of the system and/or feature being reviewed has been incorporated into this overall compliance assessment through the use of individual design calculations that represent NFPA codes that are applicable to VCSNS.

The application of these NFPA codes, relate to fire protection systems, structures and features that are considered part of the "power block", as described in NFPA 805 Section 1.6.46, and are "required" systems or features to support the results of the analysis as described in NFPA 805. This includes fire protection systems, structures and features for those plant areas that may be credited to support the nuclear safety performance criteria described in NFPA 805 Section 1.5.1, Nuclear Safety Performance Criteria, or performance based evaluations (see Section 4.8.2 of the Transition Report).

Each section and subsection of NFPA 805 Chapter 3 (Table B-1) was reviewed against the current station fire protection program. In some cases multiple compliance statements may have been assigned to a specific NFPA 805 Chapter 3 element. Where this is the case, each compliance basis statement clearly references the corresponding requirement of NFPA 805 Chapter 3. When other NFPA Codes are referenced out of NFPA 805 Chapter 3, the analysis and compliance will be performed and evaluated in a similar manner, as applicable, to the design and features at the station, subject to review and approval by the SCE&G qualified fire protection engineer.

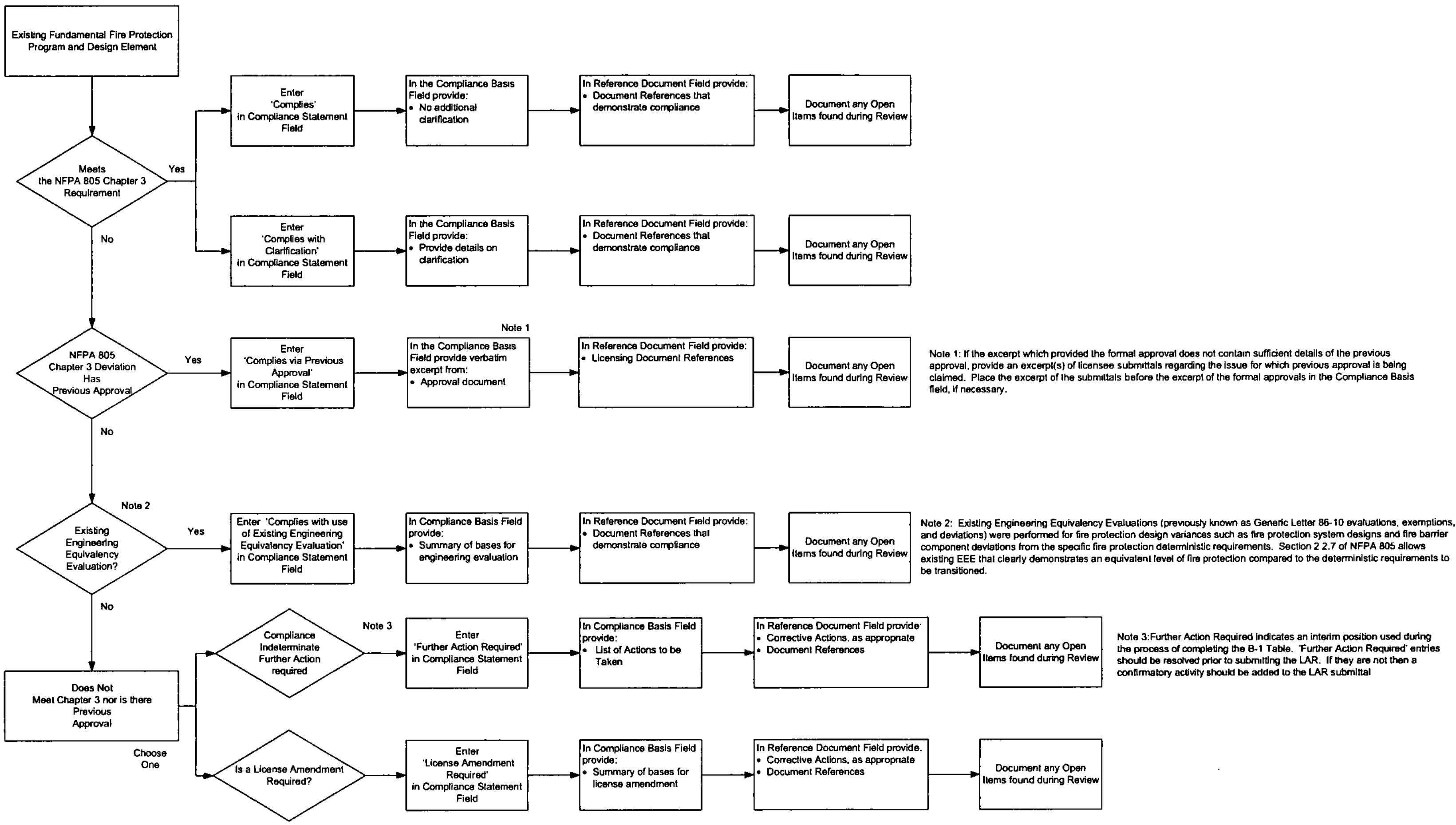

Figure 4-1 Fundamental Fire Protection Program and Design Elements Transition Process [Based on NEI 04-02 Figure 4-2][3]

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[3] Figure 4-1 depicts the process used as guidance during the transition and therefore contains elements (i.e., open items) that represent interim resolutions. Additional detail on the transition of FPEEEs is included in Section 4.2.2 of the Transition Report.

4.1.2 Results of the Evaluation Process

4.1.2.1 Evaluation of NFPA 805 Chapter 3 Requirements

The specific requirements for each of the elements in NFPA 805 Chapter 3 are provided in Table B-1 (Attachment A) and provide the results of the technical review performed by VCSNS. The transition of these "Fundamental Fire Protection Program and Design Elements" provides the basis for compliance with the requirements in NFPA 805 Chapter 3. As a result of the activities associated with the review, one or more of the following compliance statement(s) were used:

- **Complies (C)** – The existing FPP elements are determined to meet the requirements of NFPA 805 Chapter 3 element. Acknowledgement and/or restatement of the requirement are not required. An open item in this category means there are action items to be completed during implementation prior to transition. Complies directly with the requirements of NFPA 805 Chapter 3.
- **Complies by Alternative (CA)** – The existing FPP elements meet the requirements of NFPA 805 by using clarification and/or equivalent alternative(s). VCSNS requests NRC review/approval of those CA items listed in Section 4.1.2.3 (Table 4-1) of the Transition Report and included in Attachment L. Complies with clarification with the requirements of NFPA 805 Chapter 3.
- **Complies with Fire Protection Engineering Equivalency Evaluations (CE)** – The existing FPP elements have been determined to be adequate for the hazard by a FPE and to meet the NFPA 805 Chapter 3 requirements. Complies through the use of Fire Protection Engineering Equivalency Evaluations (FPEEE) which are valid and of appropriate quality. VCSNS requests NRC review/approval of those Engineering Evaluations listed in Section 4.1.2.3 (Table 4-1) of the Transition Report and included in Attachment L.
- **Complies by Previous NRC Approval (CNRC)** – The existing FPP elements specified in NFPA 805 Chapter 3 requirements are not in strict compliance, however, previous NRC approval of the configuration exists. An NRC approved alternative or deviation to NFPA 805 Chapter 3, would supplant the specific requirement of NFPA 805 Chapter 3. Where credited, these prior approvals have been incorporated into an FPEEE, and included in Attachment K and Attachment L.
- **No Review Required (NRR)** – The existing Chapter 3 elements are not based on the requirements and/or are not applicable to elements of the VCSNS Fire Protection Program.

In addition to these compliance statements, the following approaches were implemented:

- An "open item" in any category of the B-1 Table means there are action items to be completed during implementation prior to full transition of the Fire Protection Program. These open items are identified in Attachment S, Table S-2.
- The use of FPEEEs in the compliance review process is identified by the "CE" designation. These are utilized to evaluate the requirement and field conditions

and determine the level of compliance and if the element or feature is "Equivalent" or "Adequate for the Hazard." They may also be utilized to assist in the clarification of requirements, past approvals (CNRC) and field conditions that involve complex systems, features or elements that need further understanding within the FPP. The "CE" may be a self-approval, but available for review (see Section 4.2.2 of the Transition Report).

- The VCSNS process to "self-approve" selected Chapter 3 (Sections 3.8 through 3.11 of NFPA 805) elements and or submit them for NRC review and approval (Sections 3.1 through 3.7 of NFPA 805) is in accordance with the guidance provided in FAQ 06-0008 and RG 1.205 Revision 1.

Note: Specific references to VCSNS controlled documents used in this transition report are for reference use only; similar documents, updated revisions or other forms of media may be used to manage this type of information in the future.

4.1.2.2 NFPA 805 Chapter 3: "Previous NRC Approval (CNRC)"

NFPA 805 Section 3.1 states in part, "Previously approved alternatives from the fundamental protection program attributes of this chapter by the AHJ take precedence over the requirements contained herein." In some cases the prior NRC approval may be unclear for an NFPA 805 Chapter 3 program attribute, to support future clarity for NRC inspections. In other cases, the requirement has changed from the originally licensed Fire Protection Program attribute. VCSNS requests that the NRC concur with their finding of prior approval and acceptability for the following sections of NFPA 805 Chapter 3 designated as **(CNRC)**.

- None.

4.1.2.3 NFPA 805 Chapter 3: "Compliance Alternatives (CA) Not Previously Approved by NRC"

The sections of NFPA 805 Chapter 3 may not have previous NRC approval of an alternate approach, methods and/or condition which VCSNS considers to be minor variations to, and are equivalent to the NFPA 805 requirements. These "Compliance Alternatives" (CA) are identified in the compliance review of Chapter 3 and satisfy 10 CFR 50.48(c)(2)(vii). VCSNS requests NRC approval of the proposed alternatives and clarifications of the FPP elements listed in Table 4-1 below. The specific deviation and a discussion of how the alternative satisfies 10 CFR 50.48(c)(2)(vii) requirements are provided in Attachment L.

Table 4-1 NFPA 805 Chapter 3 Requests for Approval

Table B-1 Section	Requirement Summary
3.3.1.2 (1)	**Wood:** Clarification and approval is requested for limited use of non-treated wood/lumber for special conditions and operational tasks. Controls are in place to provide the appropriate reviews concerning high risk areas.
3.3.5.1	**Wiring:** Clarification and approval is requested for existing areas of the plant with limited wiring above suspended ceilings that are non-risk significant areas. Engineering Controls exist to mitigate station changes that would require the use of concealed spaces above suspended ceilings for wire routing.
3.3.5.3	**Electric Cable Construction:** Clarification and approval for existing non-compliant cable and the identified alternative flame propagation tests and controls which may have more rigorous acceptance criteria than IEEE 383-1991.
3.3.7.2	**Bulk Gas Storage:** Clarification and approval is requested for the existing horizontal, hydrogen storage tanks that are perpendicular to the Turbine Building/Control Building based on extensive spatial separation (>200 feet).
3.4.1 (d)	**Fire Brigade Notification:** Clarification and approval is requested for the verification of a fire by direct visual contact with the fire and/or products of combustion and with direct communication to the control room.
3.4.2.4	**Pre-Fire Plans:** Clarification and approval is requested for the use of multiple procedures to coordinate the fire brigade activities with other groups. The emergency procedures and brigade leader training identifies all support that may originate from the event and require coordination.
3.4.3 (a)(4)	**Records:** Clarification and approval is requested for the use of electronic records and or written records that document fire brigade member training.
3.5.15	**Yard Fire Hydrant Layout:** Clarification and approval is requested regarding the layout of existing yard fire hydrants at the station, considering the requirements found in "approximately every 250 foot spacing" guidance provided by this section.
3.6.2	**Hose Stations:** Clarification and approval is requested for existing standpipe systems that do not utilize pressure reducers based of fire brigade member hose line training and off-site fire department member training with high pressure hoses.
3.6.4	**Class III/ Seismic Analyzed Hose Stations:** Clarification and approval is requested regarding the design attributes concerning the existing installation of the Class II Hose Station and Standpipe System at the station.
3.8.2	**Detection:** Clarification and approval is requested for the existing fire detection layout of devices that are in accordance with NFPA 72E-1978 code of record.

4.1.3 Definition of Power Block and Plant

Where used in NFPA 805 Chapter 3 the terms "Power Block" and "Plant" refer to structures that have equipment required for nuclear plant operations, such as Containment, Auxiliary Building, Service Building, Control Building, Fuel Building, Radioactive Waste, Water Treatment, Turbine Building, and intake structures or structures that are identified in the facility's pre-transition licensing basis.

VCSNS reviewed the structures in the Owner Controlled Area to determine those that contain equipment that is required to meet the nuclear safety performance criteria described in Section 1.5 of NFPA 805 and are required for nuclear plant operations.

Note: Structures meeting the radioactive release criteria described in Section 1.5 of NFPA 805, but not required for nuclear plant operations, are separately screened and included in the radioactive release review as discussed in Section 4.4 and Attachment E of the Transition Report.

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

4.2 Nuclear Safety Performance Criteria

The Nuclear Safety Performance Criteria are established in Section 1.5 of NFPA 805. In addition, 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
- Defining Recovery Actions to be Transitioned
- 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 of the Transition Report.

4.2.1.1 Compliance with NFPA 805 NSCA (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 NSCA methodology against the guidance provided in NEI 00-01, Revision 1 Chapter 3, "Deterministic Methodology," as discussed in Appendix B-2 of NEI 04-02. The methodology in Figure 4-2 was used as input in assessing the existing shutdown strategy and consisted of the following activities:

- Core methodology documents and plant specific calculations/analyses were gathered.
- Each specific section of NFPA 805 2.4.2 was correlated to the corresponding section of Chapter 3 of NEI 00-01 Revision 1. 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 results of the applicability review were then documented in VCSNS Technical Report TR08620-014, "Nuclear Safety Performance Criteria Review Transition Report."
- 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 the existing shutdown analysis, no additional work was performed relative to corrective actions.
- Based on the VCSNS approach to transition the station shutdown analysis (FAQ 09-0057), project instructions and guidance were developed to analyze station circuits and documentation in accordance with NEI 00-01. A compliance review with appropriate references is contained in NEI 04-02 Table B-2 (Attachment B) to support the VCSNS transition to NFPA 805.

Note: 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.

The comparison of the VCSNS original safe shutdown methodology to NEI 00-01 Chapter 3 (NEI 04-02 Table B-2) was performed and documented in VCSNS Technical

Report TR08620-014. Based on the selection of a new shutdown strategy as part of the transition to NFPA 805, including selection of equipment and circuits, NEI 00-01 has been incorporated into the NSCA for VCSNS (Attachment B) to define areas of improvement and support resolution of deficiencies.

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 directly or met the intent of the endorsed guidance with adequate justification as documented in Attachment B. Table 4-2 includes the analysis criteria that were previously not in alignment for the existing shutdown strategy, and the corresponding improvements that were accomplished during the VCSNS NFPA 805 transition project.

Table 4-2 NEI 04-02 Improvements

Pre-Transition Assessment (NEI 00-01 Section)	Post Transition Alignment
The VCSNS Appendix R safe shutdown analysis does not include comprehensive review/ discussion of fire damage to instrument tubing and its impact on instruments credited for plant parameter monitoring. (3.2.1.7 Instrument Tubing)	The VCSNS NFPA 805 Transition Project has taken into consideration instrument tubing as a failure mechanism for the instrument function. The tubing is analyzed in support of instrument operation, documented in a manner similar to "required" cable in the Fire Area Analysis of the Nuclear Safety Capability Assessment.
A line entry for each item in the Composite Equipment List indicates the scenario (Compliance Review and/or Normal Control Review) for which the item is required, and separate line items for the support and supplemental equipment required for the item to function. However, due to credit of Operator Manual Actions and SISBO, many equipment dependencies were not considered. (3.2.2.5 Identify Dependencies Between Equipment, Supporting Equipment, Safe Shutdown Systems and Safe Shutdown Paths.)	A detailed, comprehensive analysis of equipment dependencies has been modeled and included as a part of the NFPA 805 Nuclear Safety Equipment List (NSEL) development in the NFPA 805 Transition Project.
Not all Appendix R safe shutdown equipment had their cables identified, analyzed for circuit failure consequence and located based on the shutdown strategy employed at VCSNS. However, due to credit of Operator Manual Actions and SISBO, specific identification of cables and circuit failure consequences were not considered. (3.3.1.1 Cable Selection)	For the electrical functions/equipment identified in the NFPA 805 NSEL, "required" circuits and circuit failure consequences were evaluated to support the NSCA functions have been targeted, analyzed and incorporated as input files into the Nuclear Safety Capability Assessment. As appropriate, entries will be made into the Corrective Action Program as a part of NFPA 805 implementation.
VCSNS Appendix R Analysis does not discuss electrical devices such as relays, switches and signal resistor units as being used as isolation devices. (3.3.1.3 Isolation devices)	The NFPA 805 Transition has included electrical devices such as relays, switches and signal resistor units as acceptable isolation devices, including devices in instrument loops.
The VCSNS Appendix R safe shutdown analysis evaluates the impact of a single ESFAS actuation. However, the effect of multiple ESFAS actuation was considered to be beyond the expectations of Appendix R requirements.	The consequences of multiple spurious ESFAS signals was evaluated in the NFPA 805 Transition Project to ensure that, although the components may move to their safe shutdown position, plant transient effects were evaluated. The logic for MSO scenarios, including impacts of failures have been incorporated NSCA and

Table 4-2 NEI 04-02 Improvements

Pre-Transition Assessment (NEI 00-01 Section)	Post Transition Alignment
(3.3.1.6 ESFAS Actuation)	Fire PRA Models.
The possible consequences of the spurious operation of certain valves require that the spurious operation be prevented or corrected on a priority basis. The mis alignment results from a change in regulatory philosophy resulting from MSOs. The new philosophy is defined in NEI 00-01 Revision 2; however, for NFPA 805 transition the methodology in FAQ 07-0038 was utilized. Of immediate concern are the Reactor Coolant System Hi-Lo pressure boundary valves, other valves which can result in loss of reactor coolant inventory, and valves which can result in uncontrolled steam dumping. For other valves, more time is available for correction of spurious operation. The Reactor Coolant System Hi-Lo pressure boundary valves are all 480V AC motor operated and cannot spuriously open, since power to the motors has been disconnected during normal plant operation. The remainder of the valves for which spurious operation must be corrected on a priority basis are air operated and controlled by one or more solenoid valves. For valves controlled by a single solenoid, the valve power is disconnected and the cabling to the solenoid is protected with a grounded shield (armor or conduit). This is necessary to prevent a "hot short" from spuriously operating these valves. Valves controlled by 2 or more solenoids, where de-energizing any 1 solenoid puts the valve in the safe position, only require that the valve power be disconnected. The cabling to the solenoids does not require shielding, since 2 or more "hot shorts" simultaneously would be required to spuriously operate the valve; and for non-reactor coolant pressure boundary valves, multiple hot shorts are not considered credible. Similarly, for situations involving 2 normally closed valves in series (with individual solenoids) where at least one must be kept closed, disconnecting the power to the solenoids is sufficient. Two (2) hot shorts, 1 to each solenoid, would be required to cause the flow path to be opened. The required power disconnection was accomplished in the main control board through disconnect switches. A human factors review ensured that the switches can be easily identified. In addition, a secondary means of disconnecting the solenoid power was provided in a separate fire area, for use in the unlikely event a fire occurs in the Control Room and requires immediate evacuation. This secondary means of disconnecting power consists of switches in the termination cabinets located in the cable spreading room, which is a separate fire area from the main Control Room. Human factors are also considered in the design of these switches to ensure that they can be readily located and opened. For motor operated valves where sufficient time is available, spurious	In the NFPA 805 transition project, the circuit analysis for equipment that were evaluated for spurious operation concerns conformed to the NEI 00-01 methodology that requires that multiple hot shorts (including 3-phase and proper polarity for HLP equipment) will need to be considered for safe shutdown equipment. In addition, multiple hot shorts were evaluated to determine if a spurious operation would occur to due to multiple hot shorts. Multiple hot shorts causing a single spurious operation, and resolution of multiple spurious operation (MSO) as described in FAQ 07-0038 was addressed in the NFPA 805 Transition. The NFPA 805 transition has re-evaluated the compliance strategy for mitigating spurious operation on an area-by-area basis. Manual actions that are not allowed by NRC regulations (RIS 2006-10) and that are deemed to be necessary for NSCA compliance have been evaluated as part of a Fire Risk Evaluation as acceptable "recovery actions." In general, recovery actions have been minimized for the VCSNS NFPA 805 Transition. The methodology for mitigating spurious operation also credits opening disconnect switches in the Control Room (or outside the Control Room when Control Room evacuation is necessary). A review of the electrical schematic for these solenoid valves to determine that the disconnect switches affect both the positive and negative legs of the circuitry was specifically addressed as part of the NFPA 805 Transition.

Table 4-2 NEI 04-02 Improvements

Pre-Transition Assessment (NEI 00-01 Section)	Post Transition Alignment
operation was controlled by opening the cubicle breaker in the MCC and then the valve manually repositioned locally by operating the hand wheel. The Fire Emergency Procedures [FEP] direct the tripping of the MCC cubicle breakers in a timely manner and provide separate instructions to manually reposition valves for which spurious repositioning could be detrimental to safe shutdown. These actions were consistent with the Appendix R Shutdown strategy. In many cases, manual actions at defined locations precluded spurious operation of the potentially affected equipment. For evaluation of spurious operation of equipment, the methodology that "The cabling to the solenoids does not require shielding, since 2 or more "hot shorts" simultaneously would be required to spuriously operate the valve; and for non-reactor coolant pressure boundary valves, multiple hot shorts are not considered credible" does not conform to the NEI 00-01 methodology that requires that multiple hot shorts (3-phase and proper polarity) will need to be considered for HLP equipment and safe shutdown equipment. (3.3.2 A Cables Whose Failure May Cause Spurious Actuations)	
The method of the Appendix R safe shutdown analysis was to first identify the source power circuit breakers and their "associated" breakers. After that determination, a simple one-line diagram was prepared identifying the frame size and trip setting of each breaker. From this data and the manufacturer circuit breaker trip characteristic curves, coordination curves were prepared to demonstrate visually the amount of coordination existing between the associated circuit breakers. A complete report of this coordination study was prepared and made part of the Appendix R review documentation. The results of the analysis indicated a high degree of coordination between the protective devices for the associated circuits of interest and the main protective devices for required power sources. Several cases for which the degree of coordination was insufficient were identified, and suitable new trip setting values for the circuit breakers were established and implemented. This review demonstrated that the circuit breakers were coordinated in accordance with accepted design practices and that required power sources will be adequately protected from fire induced faults on circuits "associated by common power supply." (3.3.2 B Common Power Source Cables)	The NFPA 805 transition project has analyzed common power supplies required to be energized for the NSCA function to ensure compliance with NEI 00-01. Cases where breaker coordination has been determined to be insufficient, entries will be made into the Corrective Action Program as a part of NFPA 805 implementation.
An electrical circuit term sheet is issued for each electrical cable or circuit. Each circuit sheet provides information to the field for terminating the "from" and "to" ends of each circuit. S-212-001 Sheets 1 - 11	"Required" circuits, including field routing necessary to support the selected equipment, have been identified and evaluated as part of detailed circuit analysis package for electrically operated NFPA 805 equipment

Table 4-2 NEI 04-02 Improvements

Pre-Transition Assessment (NEI 00-01 Section)	Post Transition Alignment
provide a complete description of all required fields needed for completing the electrical circuit schedule. An electrical cable pull slip is issued for each electrical cable or circuit. Each pull slip provides information to the field for routing circuits through raceways. Normally, cable pull slips are developed using the computerized cable management database, PC-CKS. Cable pull slips can be developed manually but, the PC-CKS Database should be used to verify that criteria such as raceway separation, combustible fire loading, percent fill, and weight loading are maintained. For PC-CKS to route or verify the routing of a circuit, any new cable bill of material (B/M) or new multi-cable conduit (XX) must be entered first. Refer to the following attachments: • Not all Appendix R safe shutdown equipment had their cables identified, analyzed for circuit failure consequence and located. For all equipment credited for Nuclear Safety Performance (NSP), the cable selection will need to be determined, analyzed and located. These have been entered into the Corrective Action Program. • PC-CKS includes routing of all cable trays, but not conduits. Walkdown of conduit locations will need to be performed and entered into PC-CKS. To meet this requirement, certain equipment and circuits must remain functional in the event of a fire. ES-427 provides screening and questions related to Appendix R applicability. If required, additional reviews shall be completed to address affects or involvement of an Appendix R related system (EE-06). Refer to Cable & Raceway DBD section 4.5 for further explanation of Appendix R applicability. (3.3.3.4 Identify Routing of Cables)	and functions. The results of the circuit analysis were incorporated into PC-CKS, as necessary to support the NSCA and Fire PRA analysis.
The effects of fire damage to instrument tubing were not documented in the FPER. (3.4.1.8 Consider Instrument Tubing Effects)	The VCSNS NFPA 805 Transition Project has taken into consideration instrument tubing as a failure mechanism to the instrument function. The tubing is analyzed in support of instrument operation, documented in a manner similar to "required" cable in the fire area analysis of the NSCA.

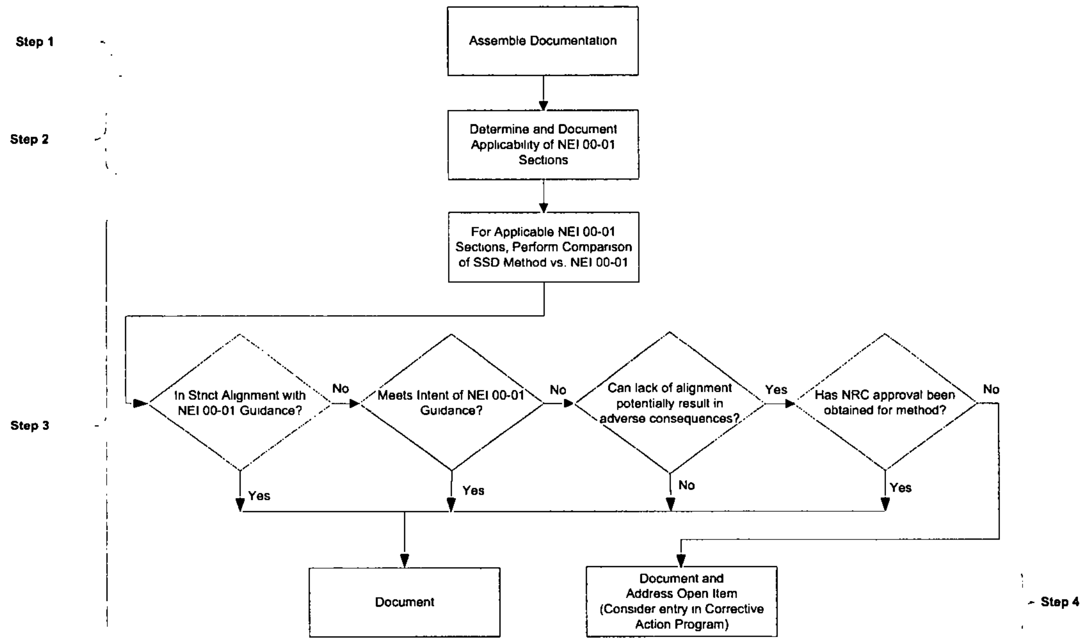

Figure 4-2 Summary of Nuclear Safety Methodology Review Process (FAQ 07-0039)

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 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

Based on VCSNS Technical Report TR08620-312, "Nuclear Safety Capability Assessment Report," the NFPA 805 licensing basis for VCSNS is to achieve and maintain Hot Standby, Mode 3, which is the basic safe and stable condition established and maintained for the NSCA. The 5 nuclear safety performance criteria (Reactivity Control, Coolant Inventory, Decay Heat Removal, Process Monitoring, and Vital Auxiliaries) are achieved by existing plant systems. Some systems, such as the Chemical and Volume Control System (CVCS), serve multiple goals of Coolant inventory addition and Boric acid addition for long term reactivity control. Following the initial coping/assessment period at the start of a fire, the operators will maintain safe and stable conditions as follows:

Safe and Stable Summary Description

- Reactivity Control is achieved by control rod insertion by manual Reactor Trip from the main control board. Operating limits on control rod bank positions assure that adequate reactivity insertion will occur, with margin. Boration is needed to maintain shutdown reactivity margin during cooldown – this is provided with the Chemical and Volume Control System (CVCS) system supplying water from the Refueling Water Storage Tank (RWST).
- Coolant Inventory is maintained by the CVCS based on a number of parameters including pressurizer level. The post-fire shutdown plan includes isolation of letdown to preserve Reactor Coolant System (RCS) inventory along with throttling charging pump injection flow to avoid RCS overfill. The assumed flow path is from the RWST (normal Volume Control Tank path is isolated) to the charging pump(s) and into the RCS via either the normal or safety injection path. Charging Pump miniflow is maintained in the open position. RCS pressure control is maintained by the ability to increase pressure by an emergency bus supplied pressurizer heater bank or by control of the charging rate, and by the ability to reduce pressure by pressurizer PORV operation.
- An important part of maintaining RCS inventory is maintaining Reactor Coolant Pump (RCP) seal integrity. RCP seal cooling is maintained by either the charging pump seal injection path or the Component Cooling (CC) flow to the RCP thermal barrier heat exchanger. Modifications are planned (see Table S-1 in Attachment S) to provide a redundant seal injection system that is independent of the existing system and not affected in the problem fire areas. Second, a new seal material is planned (see Table S-1 in Attachment S) so that the loss of seal cooling does not lead to significant loss of RCS inventory. Until new seal materials are installed, procedures for seal cooling interruptions are in place to address the issue as a part of the existing appendix R analysis.
- As part of the NSCA analysis, potential failures to components that affect RCS inventory including Power Operated Relief Valves (PORVs), failure to isolate letdown, charging pump failure, and issues associated with the Reactor Coolant Pump (RCP) seals have been considered and included in the shutdown model.

- Decay heat removal following reactor trip is provided by Emergency Feedwater System (EFW) to the Steam Generators (SGs) and atmospheric relief of steam through the safety valve(s). Other systems may be available but were not credited for the deterministic evaluation. The Thermal Hydraulic (TH) analysis also considered cooldown with only one SG available. EFW supply is initially from the Condensate Storage Tank (CST) with backup from Service water. Other sources of cooling water are not precluded. EFW flow control utilizes the flow control valves and includes the ability to isolate a Steam Generator or secure pump(s) as determined by the operator.
- Instrumentation for the transition to (and maintenance of) Hot Standby (Mode 3) consists of RCS wide range pressure, Pressurizer level, Nuclear Source Range indication, Steam Generator Pressure and level, and RCS temperature (preferably T_{hot} and T_{cold} from the steaming Steam Generator(s) loops).
- Support Systems are required for almost all safety functions and include electrical power, Service Water (SW), CC, Chilled Water, room cooling, containment cooling, and ventilation for specific rooms. Systems typically not credited (but potentially available) include instrument air, secondary side support, Industrial cooling, and other plant systems not associated with a safety function. The electrical system includes switchgear, transformers, inverters, panels, and the diesel generators.
- If evacuation of the Main Control Room was required due to a significant fire in the Control Complex, the Control Room Evacuation Panel (CREP) is designed to provide the Instrumentation and controls to maintain Hot Standby, as a Primary Control Station.

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

- *The At-Power analysis is discussed in Section 4.2.4 of the Transition Report. This analysis, which is initiated in Modes 1-2, includes actions to achieve Hot Standby. In addition, those actions necessary to achieve Cold Shutdown from Hot Standby are described.*
- *The Non-Power analysis is discussed in Section 4.3 of the Transition Report. This analysis evaluates Systems and Components for Mode 3 and below.*

After conditions stabilized, operators can initiate systems required for cooldown and depressurization to achieve and maintain Cold Shutdown. The ability to cool down to Cold Shutdown (Mode 5) is considered a subset of the NSCA at VCSNS. The compliance review demonstrates the ability to achieve and maintain safe and stable hot standby conditions. However, in the event the plant decides to transition to cold shutdown conditions, the actions needed to transition from hot standby to cold shutdown are also documented in the NSCA Report.

Cooldown Summary Description

Mode 3 – The cooldown process begins in Mode 3 and uses the SG PORVs to reduce pressure below the setpoint of the SG safety valves, which in turn cools the RCS. The EFW system flowpath and function stay the same, though slightly more flow may be

needed. Reactivity control consists of adding borated water from the RWST to the RCS - the charging pumps have ample capacity to accommodate the RCS shrinkage. The same 'safe and stable' flowpath is used - the borated water will assure that shutdown margin is maintained. Inventory control and decay heat removal uses the same methods as identified in Section 4.3.2 of the Transition Report. Likewise, the 'steady-state' Mode 3 equipment is also used for the 'cooldown' Mode 3 for the Instrumentation and Support Systems. Pressure control again uses the same equipment, but the pressure is controlled to permit blocking Engineered Safeguards Features Actuation Signals (ESFAS) and accumulator discharge to reduce pressure to the Residual Heat Removal (RHR) operating conditions (temperature and pressure). Recovery Action(s) outside the primary control station(s) may be needed for the transition from Hot Standby to Cold Shutdown.

Mode 4 – The transition to Mode 4 (Hot Shutdown) entails a number of steps to prepare the RHR system for connection to the RCS. The 5 nuclear safety performance criteria are met as follows:

- Reactivity control requirement entails a Boron concentration measurement for the RHR system
- Inventory control concern are the same – control pressure
- Decay heat removal adds RHR heat exchanger flow control
- Instrumentation adds the RHR instruments
- Support systems are the same but involve a different line-up. The RHR suction valves (8701A/B and 8702A/B) have an interlock that - depending on fire damage - may need a Recovery Action to open, and then RHR is available and the plant enters Mode 4. Once in Mode 4, EFW can be turned off and decay heat removal is by the RHR system.

Mode 5 – Cooldown to Cold Shutdown (Mode 5, RCS<200 Deg F) uses the same equipment as Mode 4 and may proceed without further significant recovery actions. Other operational concerns include mode-dependent ESF equipment operability and equipment racked out for overpressure concerns.

The ability to achieve Cold Shutdown, including any necessary cooldown actions, is documented in VCSNS Technical Report TR08620-312 on a Fire Area basis.

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 Operator Manual Actions (OMA) 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 define and assess the Recovery Actions necessary to support the goals of the NFPA 805 Nuclear Safety

Capability Assessment for VCSNS. This process was initially based on FAQ 07-0030 (ML110070485) and consists of the following steps:

- Step 1: Define the primary control station(s) and determine which pre-transition OMAs are taken at the primary control station(s).

Note: Activities that take place at primary control station(s), including those required to enable the primary control station, or in the Main Control Room, are not recovery actions, by definition (Reg Guide 1.205, Section 2.4).

- Step 2: Determine the population of recovery actions that are required to resolve VFDRs, and are therefore subject to a risk informed evaluation (including defense in depth considerations).
- Step 3: Evaluate the additional risk of the use of recovery actions.
- Step 4: Evaluate the feasibility of the recovery actions.
- Step 5: Evaluate the reliability of recovery actions.

Results

The population of Recovery Actions credited for compliance with NFPA 805 is included in Attachment G, Table G-1. The risk associated with the Recovery Actions, including an assessment of Feasibility and Reliability, are documented in, "Fire PRA Human Reliability Analysis Report," which is found in VCSNS Design Calculation DC00340-001, "Fire PRA Plant Final Report," Attachment 10 and "Fire Risk Evaluation Report NFPA 805," PRA Evaluation 11-04. Table G-2 provides the bounding delta Human Error Probability (HEP) calculation that was used to model the elimination of the use of recovery actions and obtain the additional risk of recovery.

4.2.1.4 Evaluation of Multiple Spurious Operations

Overview of Process

The prevailing guidance for consideration of Multiple Spurious Operations (MSOs) is provided in the FAQ 07-0038 closeout memorandum dated February 3, 2011 (ML110140242). As part of the NFPA 805 transition project, a review and evaluation of VCSNS susceptibility to fire-induced MSOs was performed. The original process was conducted in accordance with NEI 04-02, Revision 2 and RG 1.205, and was supplemented by FAQ 07-0038 Revision 3 as the review progressed. The original approach outlined in Figure 4-3 (based on Figure 4-8 from FAQ 07-0038 Rev 1) is similar to the method to address fire-induced MSOs in the final process approved in FAQ 07-0038 Rev 3. The method to support the transition to NFPA 805 was refined to consist of the following steps:

- Identify potential MSOs of concern, based on Draft E PWROG Generic MSO list dated March 26, 2008.
- Conduct an expert panel to assess plant specific vulnerabilities (e.g., per NEI 00-01, Rev. 1 Section F.4.2).
- Update the Fire PRA model and NSCA to include the MSOs of concern.
- Evaluate for NFPA 805 compliance.
- Document results.

The process and inputs are described in VCSNS Technical Report TR08620-025. The results are integrated into the Fire PRA and NSCA models and support the transition to a new licensing basis. The Post-transition 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 will be part of the plant change review process, Industry OE Review and/or Self-Assessment process.

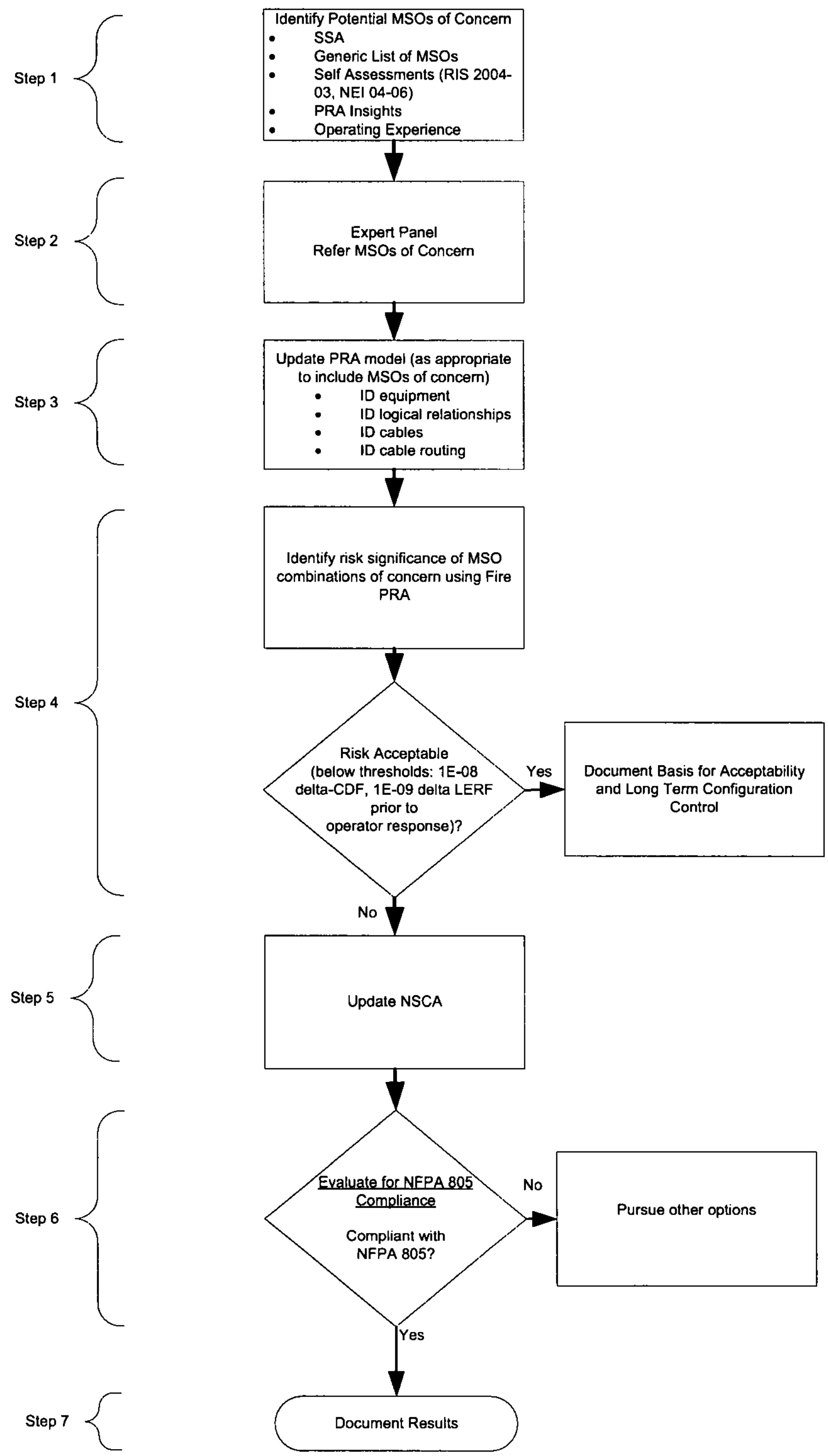

Figure 4-3 Multiple Spurious Operations – Transition Resolution Process (Based on FAQ 07-0038 Revision 1 and later modified)

Results

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

4.2.2 Fire Protection Engineering Equivalency Evaluation (FPEEE) Transition

Overview of Evaluation Process

The FPEEEs 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 FPEEE review includes the following determinations:

- The FPEEE is not based solely on quantitative risk evaluations,
- The FPEEE is an appropriate use of an engineering equivalency evaluation,
- The FPEEE is of appropriate quality,
- The standard license condition is met,
- The FPEEE is technically adequate,
- The FPEEE reflects the plant as-built condition, and
- The basis for acceptability of the FPEEE 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, FPEEEs 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" FPEEEs, then the FPEEE was referenced and a brief description of the evaluated condition was provided. These are referenced in the Attachments A and C as appropriate.
- If requesting specific NRC approval for "adequate for the hazard" FPEEEs, then FPEEE was referenced to demonstrate compliance and was included in Attachment K or Attachment L, as appropriate for NRC review and approval.

When NRC approval is requested or required, the reliance on FPEEEs to demonstrate compliance with NFPA 805 requirements was documented in the LAR.

Results

The review results for FPEEEs are documented in SCE&G controlled documents, and summarized in Table 4-3 in Section 4.2.3 of the Transition Report. Any FPEEEs where SCE&G request specific NRC review and approval are included in Attachment K or Attachment L. Other FPEEEs, not submitted for NRC approval are controlled, and available for onsite review.

4.2.3 Licensing Actions: Resulting NFPA 805 Analysis & Transitions

Overview of Evaluation Process

The review of new and/or existing licensing actions (deviations) 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.
- Incorporation of existing, credited licensing actions into FPEEEs.

Results

- As a result of the review, selected Deterministic Requirement Open Item Descriptions (DROIDs) (see Attachment C) were identified that were deterministic (NFPA 805, Chapter 4.2.3) in nature and were dispositioned with prior NRC approval or requires NRC approval. These actions are summarized below in Table 4-3, documented in FPEEEs, with the licensing action itself, and if previously existing, are identified in Attachment K.
- When identified, the previous licensing actions will be transitioned into the NFPA 805 fire protection program as previously approved per NFPA Section 2.2.7 or as new licensing actions requiring approval per NFPA Section 4.2.3. Upon approval, these licensing actions are considered compliant under 10 CFR 50.48(c).

Table 4-3 NSCA FPEEs/ Licensing Actions

FPEEE	Licensing Action	Description
TR0780E-001, AB01-01	LA-AB01-01	**Auxiliary Building:** Assess the lack of 20 foot separation and full automatic suppression in fire zone AB01.09 for compliance with Section 4.2.3.3(c) of NFPA 805-2001.
TR0780E-001, AB01-02	None	**Auxiliary Building:** Assess the lack of automatic fire suppression in fire zone AB01.08 for compliance with Section 4.2.3.3(b) of NFPA 805-2001.
TR0780E-001, AB01-03	LA-AB01-03	**Auxiliary Building:** Assess the lack of full automatic suppression in fire zone AB01.21 for compliance with Section 4.2.3.3(b) of NFPA 805-2001.
TR0780E-001, AB01-04	None	**Auxiliary Building:** Assess the adequacy of specific barriers that have been credited in the Nuclear Safety Capability Assessment (NSCA) as a feature that provides sufficient fire resistive capability to prevent fire damage outside the fire area/zone per Section 4.2.3.3(a) of NFPA 805-2001.
TR0780E-001, CB02-01 TR0780E-001, IB25-01	LA-CB02-01 LA-IB25-06	**Control, Intermediate Buildings:** Assess the use of Rockbestos Firezone R cable as a replacement for a 1-hour barrier for redundant safe shutdown equipment/circuits in Fire Area CB02 and fire zone IB25.01.02 to comply with Section 4.2.3.3(c) of NFPA 805-2001.
TR0780E-001, DB-01	None	**Electrical Underground Duct Bank:** Assess the lack of 20 foot separation between Train "A" and Train "B" circuits in some of the Electrical Duct Banks (Fire Area DB), a lack of automatic fire detection and a lack of automatic fire suppression in Fire

Table 4-3 NSCA FPEEs/ Licensing Actions

FPEEE	Licensing Action	Description
		Area DB in order to comply with Section 4.2.3.3(b) of NFPA 805-2001.
TR0780E-001, FH01-01	None	**Fuel Handling Building:** Assess the lack of full automatic fire suppression throughout fire area FH01 in the Fuel Handling Building in order to comply with Section 4.2.3.3(b) of NFPA 805-2001.
TR0780E-001, IB07-01	LA-IB07-01	**Intermediate Building:** Assess the lack of 20 foot separation in fire area IB07 for compliance with Section 4.2.3.3(b) of NFPA 805-2001.
TR0780E-001, IB25-02	LA-IB25-01	**Intermediate Building:** Assess the lack of 20 foot separation in fire zone IB25.01 for compliance with Section 4.2.3.3(b) of NFPA 805-2001.
TR0780E-001, IB25-03	LA-IB25-02 LA-IB25-03	**Intermediate Building:** Assess the lack of 20 feet of physical separation between fire subzones IB25.01.01 and IB25.01.02 for compliance with Section 4.2.3.3(b) of NFPA 805-2001.
TR0780E-001, IB25-04	None	**East Penetration Access Area:** Assess the lack of automatic fire suppression in fire zone IB25.03 East Penetration Access Area (Room 12-01) in order to comply with Section 4.2.3.3(b) of NFPA 805-2001.
TR0780E-001, IB25-05 / RB01-01	LA-IB25-04 LA-RB01-01	**Intermediate, Reactor Buildings:** Assess the continuous availability of process monitoring equipment in fire zones RB01.01.01 and IB25.04 in order to comply with Section 1.5.1(a), (b), (c), and (d) and Section 4.2.3.3(a) or Section 4.2.3.4(b) of NFPA 805-2001.
TR0780E-001, IB25-06	LA-IB25-05	**Intermediate Building:** Assess the lack of automatic fire suppression in Fire Area IB25, specifically fire subzone IB25.06.02 containing redundant safe shutdown circuits in order to comply with Section 4.2.3.3(b) of NFPA 805-2001.
TR0780E-001, IB25-07	None	**Intermediate Building:** Assess the adequacy of specific barriers that have been credited in the Nuclear Safety Capability Assessment (NSCA) as a feature that provides sufficient fire resistive capability to prevent fire damage outside the fire area/zone per Section 4.2.3.3(a) of NFPA 805-2001.
TR0780E-001, MH02-01	LA-MH02-01	**Electrical Man Hole:** Assess the lack of 20'-0" of physical separation between Train "A" and Train "B" equipment/circuits, the lack of automatic fire detection, and the lack of automatic fire suppression in fire area MH02 for compliance with Section 4.2.3.3(b) of NFPA 805-2001.
TR0780E-001, SWPH05-01	LA-SWPH05-01	**Service Water Pump House:** Assess the lack of 20 foot of separation in fire area SWPH05 for compliance with Section 4.2.3.3(b) of NFPA 805-2001.
TR0780E-001, YD02-01	LA-YD02-01	**Yard, CST:** Assess the lack of automatic fire suppression and fire detection in fire zones YD02.01 and YD02.02 for compliance with Section 4.2.3.3(b) of NFPA 805-2001.
TR0780E-006, FEAT-02	None	**Various Areas:** Determine the adequacy of the fire resistive capabilities for the embedded electrical raceway conduits and their associated pull boxes containing cables/circuits important to safety and safe shutdown of the plant.
TR0780E-006, FEAT-04	LA-FEAT-04	**Various Areas:** Review and document previous NRC approval for the installation of unlisted fire doors in select fire barriers required per the performance requirements established by

Table 4-3 NSCA FPEEs/ Licensing Actions		
FPEEE	**Licensing Action**	**Description**
		National Fire Protection Association NFPA 805-2001, Chapter 4 Section 3.11.
TR0780E-006, FEAT-05	LA-FEAT-05	**Various Areas:** Review and document previous NRC approval for the installation of dual 1½ hour rated fire dampers mounted "back-to-back" in 3 hour rated fire barriers required per the performance requirements established by NPFA 805-2001, Chapter 4 and Section 3.11.

The licensing actions listed in Table 4-4 are no longer necessary and will not be transitioned into the NFPA 805 fire protection program.

Table 4-4 Licensing Actions Not Being Transitioned to NFPA 805

Licensing Action ID	Description	Reason No Longer Necessary
LA-AB01-02	Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)	No compliance strategy utilized in this area for NFPA 805 requires automatic suppression.
LA-CB12-01	Appendix R Deviation, Control Building - Lack of 1-hour fire rated barrier (III.G.2.c criteria)	Circuits for INI00031 no longer routed in CB12. 1-hr barrier no longer required.
LA-CB17-01	Appendix R Deviation, Control Building - Lack of Automatic Suppression (III.G.3 criteria)	Performance-Based methods in NFPA 805 include analysis for lack of suppression in the control room. Therefore, this Licensing Action will not be transitioned into NFPA 805.
LA-IB03-01	Appendix R Deviation, Intermediate Building - Lack of 3-hour fire rated barrier (III.G.2.a criteria)	All RCS Temperature for indication at the MCB is embedded in IB03. Embedded conduits evaluated in TR0780E-001.
LA-IB04-01	Appendix R Deviation, Intermediate Building - Lack of 3-hour fire rated barrier (III.G.2.a criteria)	Current NSCA model does not reveal a need to credit substitution of Process Monitoring instruments.
LA-IB10-01	Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)	Fire Risk Evaluation utilized to address lack of automatic suppression in the area.
LA-IB11-01	Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)	Utilizing PB Fire Modeling in this area to resolve lack of automatic suppression failure.
LA-IB12-01	Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)	Fire Risk Evaluation utilized to address lack of automatic suppression in the area.
LA-IB16-01	Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)	No compliance strategy utilized in this area for NFPA 805 requires automatic suppression.
LA-IB17-01	Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)	No compliance strategy utilized in this area for NFPA 805 requires automatic suppression.
LA-IB19-01	Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)	No compliance strategy utilized in this area for NFPA 805 requires automatic suppression.
LA-IB24-01	Appendix R Deviation, Various Areas - Lack of Automatic Suppression (III.G.2 criteria)	No compliance strategy utilized in this area for NFPA 805 requires automatic suppression.
LA-YD01-01	Appendix R Deviation, Various Areas - Lack of Automatic Fire Detection (III.F criteria)	Fire Risk Evaluation utilized to address lack of automatic suppression in the area.
LA-YD02-02	Appendix R Modification, Yard Areas - Lack	Human Reliability Analysis includes factors such

Table 4-4 Licensing Actions Not Being Transitioned to NFPA 805

Licensing Action ID	Description	Reason No Longer Necessary
	of 8-hr battery backed emergency lighting (III.J criteria)	as lack of emergency lighting in NFPA 805. Licensing action for lack of Emergency Lighting not required to be transitioned to NFPA 805.

VCSNS was licensed to operate after January 1, 1979 and as such, 10 CFR 50 Appendix R is not applicable and exemptions from the regulation were not necessary. Since the deviations are either compliant with 10 CFR 50.48(c) or no longer necessary, as discussed in Attachment M, upon issuance of the new 10 CFR 50.48(c) license condition, the current VCSNS license condition will be superseded. VCSNS understands that implicit in the superseding of the current license condition, all prior fire protection program Safety Evaluation Reports and commitments will be superseded in their entirety.

4.2.4 Fire Area Disposition

Overview of Evaluation Process

The Fire Area Transition (NEI 04-02 Table B-3) was performed using the methodology contained NEI 04-02, FAQ 07-0054 and FAQ 09-0057. The methodology for performing the Fire Area Transition, depicted in Figure 4-4, is outlined below.

> Note: Throughout this report, deterministic open items are referred to as DROIDs. DROIDs that are dispositioned using performance-based evaluations (fire modeling or fire risk evaluations) are referred to as Variances From the Deterministic Requirements (VFDRs).

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.

- Assess accomplishment of nuclear safety performance goals. Documented the method of accomplishment, in summary level form, for the fire area. The overview of accomplishment of each of the performance goals is included in Attachment C.
- 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 document the results of the review. See Section 4.2.3 of the Transition Report.
- Performed fire protection engineering equivalency evaluation reviews. Performed a review of fire protection engineering equivalency evaluations (or created new evaluations) documenting the basis for acceptability. See Section 4.2.2 of the Transition Report.

- Defined recovery actions to support NSCA performance goals 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 of the Transition Report.
- Defined modifications to achieve deterministic compliance with the NSCA criteria on a case by case basis.

Step 3 – DROID Identification and characterization. For those items in Step 2 that were not resolved by deterministic compliance (NFPA 805, Section 4.2.3), the process identified DROIDs. Developed DROID problem statements to support resolution.

Step 4 – Preliminary Disposition. Define options to disposition DROIDs, which may include modifications or performance-based evaluations (fire modeling or fire risk evaluations). For resolution via performance-based evaluations (VFDRs), see Section 4.5.2 of the Transition Report for additional information.

Step 5 – Final Disposition.

- Documented final disposition of the DROIDs and, as applicable, VFDRs in Attachment C (NEI 04-02 Table B-3).
- For Recovery Action compliance strategies, ensured the HRA of the required recovery actions was completed. See Section 4.2.1.3 of the Transition Report for additional information.
- Documented the post transition NFPA 805 Chapter 4 compliance basis in Attachment C.

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. For additional discussion, see Section 4.8.2 of the Transition Report.

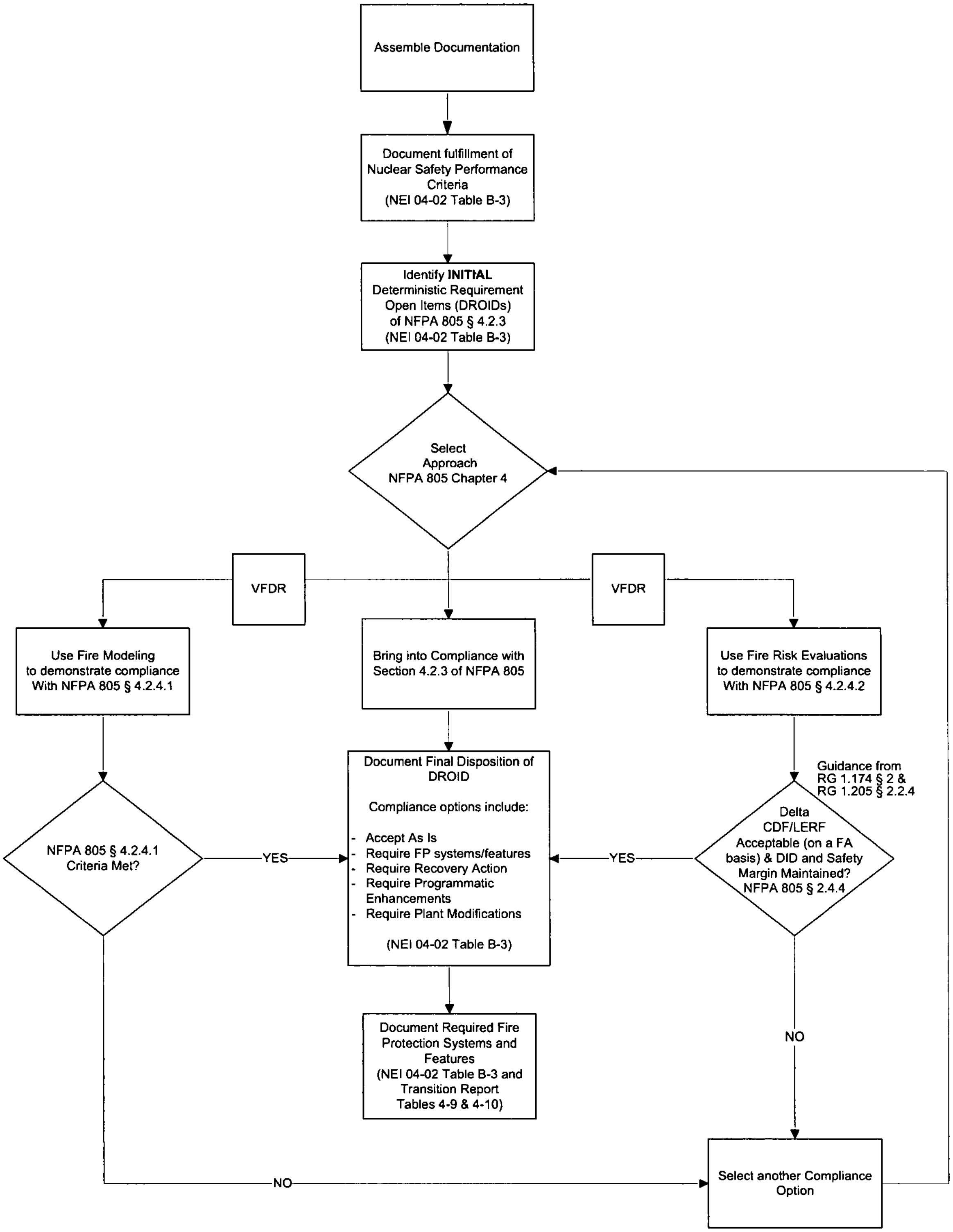

Figure 4-4 Summary of Fire Area Review
[Based on FAQ 07-0054 Revision 1 and modified per the VCSNS process]

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. Attachment C also contains an overview of accomplishment of each of the performance goals.

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

- Regulatory Basis – NFPA 805 post-transition regulatory bases (4.2.3/4.2.4).
- Performance Goal Summary – An overview of the method of accomplishment of each of the performance criteria in NFPA 805 Section 1.5 is provided.
- Reference Documents – Specific references to NSCA Documents.
- DROIDs – Specific Deterministic Requirement Open Item Descriptions of NFPA 805 Section 4.2.3. References to disposition each DROID has been provided.

  Resolutions to NSCA DROIDs which been resolved by a deterministic -based methods have been summarized in Attachment C, and documented in VCSNS Technical Report TR08620-312 and include the following information to meet the deterministic requirements:

  - **Modifications –** Attachment S contains a list of required modifications for the fire area or fire zone in support of resolving compliance issues.
  - **FPEEE –** Specific references to FPEEE 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 is provided.
  - **Licensing Actions –** Specific references to prior approved and credited exemption requests, deviations, and/or safety evaluations that will remain part of the post-transition licensing basis. A reference to those credited licensing actions are found in the FPEEE, with a brief description of the condition and the basis for acceptability of the Licensing Action found in Attachment K.

  Resolutions to NSCA DROIDs which have not been resolved by a deterministic- based methods, an assessment of viability to resolve using a performance based solution (VFDR) was completed. When used, this approach to resolution has also been documented in Attachment C, and in VCSNS Technical Report TR08620-312. These actions may include:

  - **Performance-Based Evaluation: Fire Modeling (VFDR) –** A summary of the results of the Performance-Based Fire Modeling developed to disposition a VFDR, developed in accordance with NFPA 805, Section 4.2.4.1.
  - **Performance-Based Evaluation: Fire Risk Evaluations (VFDR)** – A summary of the results of the Fire Risk Evaluations developed to disposition a VFDR, developed in accordance with NFPA 805, Section 4.2.4.2.

  - **Recovery Actions** – A summary of any required Recovery Actions necessary to disposition a DROID. References to the feasibility analysis are described in Section 4.2.1.3 of the Transition Report. See also Attachment G.
- Required FP Systems/ Features – Specific FP systems and features necessary to support the results of the analysis (see Section 4.8.2 of the Transition Report).

4.3 Non-Power Operational Modes

4.3.1 Overview of Evaluation Process

VCSNS implemented the process outlined in NEI 04-02 and FAQ 07-0040, Non-Power Operations Clarification. The goal (as depicted in Figure 4-5) is to ensure that contingency plans are established when the plant is in a 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:

- Reviewed the existing Outage Management Processes.
- Identified Equipment/Cables necessary for each Mode of Station Operation:
  - Reviewed plant systems and key components to define the success paths that support each of the defense-in-depth Key Safety Functions (KSFs), and
  - Identified cables required for the selected components and determined their routing.
- Performed Fire Area Assessments to define redundant functions that may be affected by a postulated fire in a fire area (pinch-points).
- Developed strategies to manage pinch-points associated with fire-induced vulnerabilities during NPO modes.

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

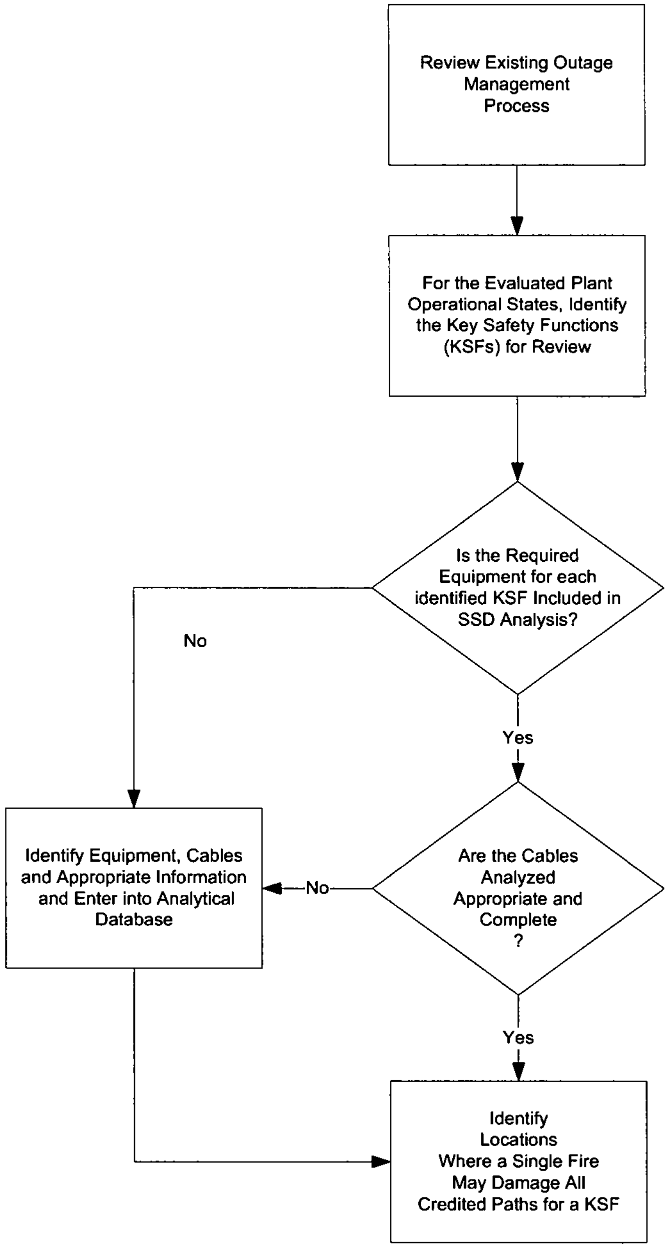

Figure 4-5 Review POSs, KSFs, Equipment, and Cables, and Identify Pinch Points

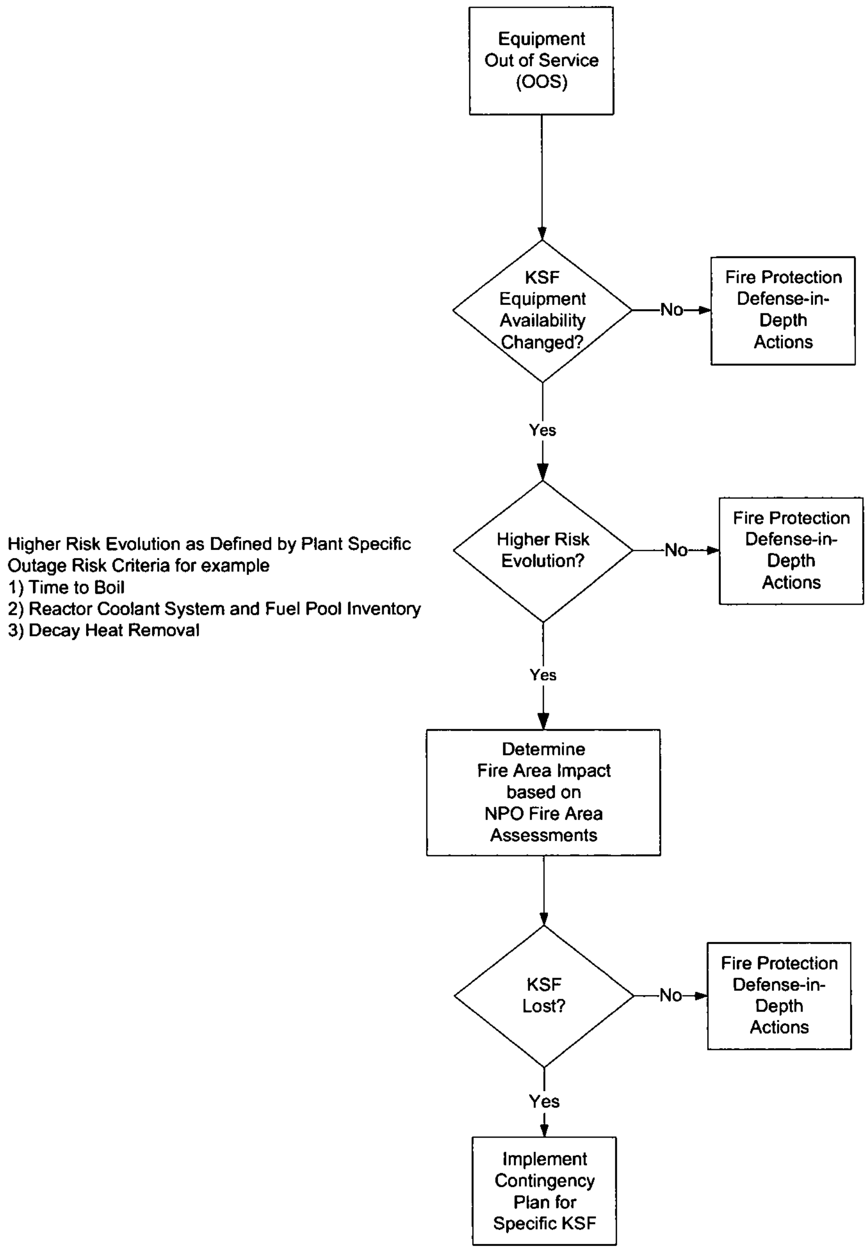

Figure 4-6 Manage Pinch Points

4.3.2 Results of the Evaluation Process

The non-power modes transition review was conducted in accordance with the methodology described in NFPA 805 Section 2.4.2 and Appendix B.2, NEI 04-02 Section 4.3.3 and Appendix F, and FAQ 07-0040. The results of the review are documented in VCSNS Technical Report TR07800-008, "Non-Power Operation Modes Transition Review and Table F-1."

The Plant Operating States considered for equipment and cable selection are defined in the technical report. The report uses nuclear safety performance criteria for non-power modes of operation to establish Key Safety Functions (KSF). It then identifies a range of equipment that is available to satisfy the KSFs in support of the nuclear safety objectives. The active components identified in the success path logic diagrams are consolidated into a single NPO equipment list. Interested stakeholders, including representatives from Engineering, Operations, Outage Management and PRA, formed an expert panel to review the KSFs, Success Paths and preliminary equipment spreadsheets. The NPO integration methodology was validated and success paths and associated components were added or screened as necessary to assure a comprehensive NPO equipment list was produced.

For the functional states identified, cable selection and circuit analysis was performed. Circuit Analysis worksheets and drawing markups were developed, reviewed and verified, and the results were entered into the analytical models and databases. Cable/Conduit routing was defined, as necessary, and updated into the VCSNS Cable Management System.

An analysis was performed using compliance assessment software for each Fire Area using the "baseline" equipment set to determine whether each KSF could be met using the specified success paths. Each Fire Area was then analyzed to identify potential "Pinch Points" where fire induced failures could potentially prevent the achievement of a KSF. Approximately 50 "pinch points" were identified.

Compliance strategies that meet the deterministic requirements of NFPA 805 were developed. If no deterministic compliance strategy could be established without the need for a plant modification, contingency actions were established. These contingency actions include identifying alternate methods of recovering the affected equipment and changes to processes and procedures that will minimize the potential for the evolution of fires in areas of the plant critical to the operation of credited NPO equipment. The compliance strategies and contingency actions used to recover the affected components were presented to a panel of operations and outage management personnel for concurrence. The compliance assessment provides an accounting of recovery actions that would be required to be credited following implementation of the changes to outage processes, procedures or system design identified in the report. Additional changes to plant processes and/or procedures will be made to incorporate the contingency actions.

See Attachment D for details. Based on incorporation of the recommendations from the technical report into appropriate plant procedures, during the implementation phase of the NFPA 805 transition, the performance goals for Non-Power Operations are fulfilled and the requirements of NFPA 805 are met.

4.4 Radioactive Release Performance Criteria

4.4.1 Overview of Evaluation Process

The review of the fire protection program against NFPA 805, Section 1.5.2 and FAQ 09-0056 for fire event related radioactive release was performed using the methodology

documented in VCSNS Technical Report TR07800-006, "NFPA 805 Radioactive Release Report." The methodology is summarized as follows:

- Reviewed fire pre-plans, fire brigade training materials, and plant procedures 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 operating modes (including full power and non-power conditions). Otherwise, provided a bounding analysis, quantitative analysis, or other analysis that demonstrates that the limitations for instantaneous release of radioactive effluents specified in the unit's Technical Specifications are met.

4.4.2 Results of the Evaluation Process

The radioactive release review determined the fire protection program will be compliant with the requirements of NFPA 805 and the guidance in NEI 04-02 and RG 1.205 upon completion of the open items identified in Attachment E. See Attachment S, Table S-2, for the corresponding implementation items.

The site specific review of the direct effects of fire suppression activities on radioactive release is summarized in Attachment E.

The review determined that radiation release to any unrestricted area due to the direct effects of fire suppression activities (but not involving fuel damage) would be as low as reasonably achievable and would not exceed applicable 10 CFR, Part 20 and Part 50 limits.

The main strategy for complying with the radioactive release requirements in NPFA 805 and the guidance in NEI 04-02 and RG 1.205 is ensuring that all buildings or areas containing radioactive hazards or the potential for an uncontrolled release during a fire have adequate strategies to minimize the uncontrolled release of radioactive material during fire fighting activities. This includes the revision or creation of documentation such as fire pre-plans, fire brigade training materials, and fire emergency procedures. This documentation is then managed through responsibilities defined in the Station Fire Protection Program, and implemented primarily through the Station Training Organization to ensure that NFPA 805 Radioactive Release objectives will continue to be met in the future.

4.5 Fire PRA and Performance-Based Approaches

RI-PB evaluations are an integral element of an NFPA 805 fire protection program. Key parts of RI-PB evaluations include:

- A Fire PRA (discussed in Section 4.5.1 and Attachments U, V, and W of the Transition Report).
- NFPA 805 Performance-Based Approaches (discussed in Section 4.5.2 of the Transition Report).

4.5.1 Fire PRA Development and Assessment

In accordance with the guidance in RG 1.205, a Fire PRA model was developed for VCSNS in compliance with the requirements of Part 4 "Internal Fires at Power Probabilistic Risk Assessment Requirements," of the ASME and ANS combined PRA Standard, ASME/ANS RA-Sa-2009, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Application," (hereafter referred to as Fire PRA Standard). VCSNS conducted peer reviews by independent industry analysts in accordance with RG 1.200 prior to a risk-informed submittal. The resulting fire risk assessment model is used as the analytical tool to perform Fire Risk Evaluations during the transition process.

Section 4.5.1.1 of the Transition Report describes the Internal Events PRA model. Section 4.5.1.2 describes the Fire PRA model. Section 4.5.1.3 describes the results and resolution of the peer reviews of the Fire PRA, and Section 4.5.1.4 describes insights gained from the Fire PRA.

4.5.1.1 Internal Events PRA

The VCSNS base internal events PRA Revision 6a was the starting point for the Fire PRA.

The internal events PRA was modified to capture the effects of fire both as an initiator of an event and the subsequent potential failure modes for affected circuits or individual targets.

The VCSNS internal events PRA had a peer review performed in August 2002 in accordance with guidance in NEI-00-02, Industry PRA Peer Review Process. All A & B level Findings and Observations from the WOG Internal Events PRA Peer Review have been addressed. Although all C & D level findings have not been incorporated, all of the items that had the potential to significantly impact model results have been resolved. Following completion of sufficient work to address the Peer Review comments, a 2005 gap assessment of the VCSNS Internal Events PRA was performed to determine the scope of work required to ensure the VCSNS Internal Events PRA meets Regulatory Guide 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 1. The results of this review indicated that VCSNS had resolved most of the issues identified in the original peer review, but the review identified some F&Os that needed additional work as well as several new issues. Additionally (in this 2005 review) the VCSNS PRA was found to meet CC-II or better for 211 of the 271 SRs from the ASME PRA Standard, but 45 of the elements were found to either not meet the requirement or to meet the requirements at a CC-I level. Following work at VCSNS to address the findings and to increase the capability category ratings of the elements that needed an upgrade to allow use of the model in risk informed applications, a focused review was performed as required by the ASME RA-S-2002, "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications" (and 2007 addenda ASME RA-Sc-2007, Appendix A). The conclusion of this 2007 focused review is that the model is of sufficient quality for use as a basis in developing a Fire PRA Model.

The results are summarized in Attachment U.

4.5.1.2 Fire PRA

The Fire PRA was conducted in accordance with the requirements of the combined PRA Standard, "ASME/ANS RA-Sa-2009," developed by the American Society of Mechanical Engineers (ASME) and the American Nuclear Society (ANS). The Fire PRA was performed using state-of-the-art PRA methodologies, including those developed jointly by the NRC's Office of Nuclear Regulatory Research (RES) and the Electric Power Research Institute (EPRI) that are described in NUREG/CR-6850/EPRI-1011989 and Fire PRA related FAQs.

The Internal Events PRA CDF and LERF models were used as the basis for the plant response model for fire, with modifications to account for fire-induced failures. FRANX and Computer Aided Fault Tree Analysis (CAFTA) are the two primary software tools used for development of the Fire PRA model. A Fire PRA model is developed and quantified to obtain fire risk results. CDF and LERF models are quantified for each fire scenario. In the initial quantification, CCDP is calculated for each fire scenario. To quantify CCDPs, fire scenario frequencies are set to 1.0. To quantify overall CDF, fire scenario frequencies determined as part of the Fire PRA process are combined with the appropriate CCDPs for each fire scenario. Details of the Fire PRA development are documented in "Fire PRA Plant Response Model Report," Attachment 4 to VCSNS Design Calculation DC00340-001, "Fire PRA Plant Final Report."

Fire Model Utilization in the Application

Fire modeling was performed as part of the Fire PRA development (NFPA 805 Section 4.2.4.1). RG 1.205, Regulatory Position 4.2 and Section 5.1.2 of NEI 04-02, provide guidance to identify fire models that are acceptable to the NRC for plants implementing a risk-informed, performance-based licensing basis.

The following fire models were used:

- NUREG-1805, Fire Dynamic Tools (FDT^s)
- Consolidated Fire and Smoke Transport Model (CFAST)

The acceptability of the use of these fire models is included in Attachment J.

4.5.1.3 Results of Fire PRA Peer Review

The VCSNS Fire PRA (VCS FRANX Model – FOR REPORT 1-21.zip) was peer reviewed against the requirements of ASME/ANS RA-Sa-2009, Part 4. A peer review was conducted during the period of August 16, 2010 through August 20, 2010, and a follow-on peer review was conducted the week of February 21, 2011.

All the finding F&Os were resolved and the resolutions incorporated into the Fire PRA model. The disposition of these F&Os and justification for the Fire PRA meeting Capability Category II of the combined ASME/ANS Fire PRA Standard (ASME/ANS RA-Sa-2009) is provided in Attachment V.

4.5.1.4 Risk Insights

Risk insights were documented as part of the development of the Fire PRA. The total plant fire CDF/LERF was derived using the NUREG/CR-6850 methodology for Fire PRA development and is useful in identifying the areas of the plant where fire risk is greatest.

A review of the fire initiating events that collectively represent 95% of the calculated fire risk is included as Attachment W.

4.5.2 Performance-Based Approaches

NFPA 805 outlines the approaches for performing performance-based analyses. As specified in Section 4.2.4 of the Transition Report, there are generally two types of analyses performed for the performance-based approach:

- Fire Modeling (NFPA 805 Section 4.2.4.1).
- Fire Risk Evaluation (NFPA 805 Section 4.2.4.2).

4.5.2.1 Fire Modeling Approach

Overview of Evaluation Process

Fire Modeling Evaluations were completed as part of the VCSNS NFPA 805 transition. These Fire Modeling Evaluations were developed using the process described in VCSNS design calculation, "Fire Modeling: Generic Methodology." This methodology is based upon the requirements of NFPA 805, industry guidance in NEI 04-02, and RG 1.205.

NFPA 805 Section 4.2.4.1 identifies the specific use of fire modeling as a performance-based method. The Fire Modeling Evaluation process consists of the following steps:

- Step 1 – Identified the targets.
- Step 2 – Established damage thresholds.
- Step 3 – Determined limiting condition(s).
- Step 4 – Established fire scenarios (Maximum Expected and Limiting).
- Step 5 – Determined protection of required nuclear safety success path(s).
- Step 6 – Provided operations guidance, as necessary.

The acceptance criteria for the Fire Modeling Evaluation consist of two parts.

- **Target Damage –** The fire modeling analysis defines and evaluates a postulated scenario involving the Maximum Expected Fire Scenario (MEFS). If target set damage does not occur then first acceptance criterion is met.
- **MEFS<<LFS –** The performance of fire modeling involves a degree of uncertainty. This uncertainty is addressed indirectly by the determination of the Limiting Fire Scenario (LFS). A comparison of MEFS and LFS is used to determine if a sufficient fire modeling margin exists. If sufficient fire modeling margin exists, then the fire modeling approach is acceptable. A quantitative risk assessment does not have to be performed since qualitatively the conclusion can be made that the VFDR has a minimal impact on risk. (MEFS does not generate damage, and MEFS - LFS margin is sufficiently large to address uncertainties in modeling.)

Fire Model Utilization in the Application

RG 1.205, Regulatory Position 4.2 and Section 5.1.2 of NEI 04-02, provide guidance on documenting the fire models used, and justifying that these fire models and methods are acceptable for use in performance-based analyses when performed by qualified

users, have been verified and validated, and are used within their limitations and with the rigor required by the nature and scope of the analyses. The following fire models were used:

- NUREG-1805, Fire Dynamic Tools (FDT^s)
- Consolidated Fire and Smoke Transport Model (CFAST)

The acceptability of the use of these fire models is included in Attachment J.

Note: At VCSNS, the use of the fire modeling option (see NFPA 805, Section 4.2.4.1) to disposition potential variances from deterministic requirements follows a pre-defined process documented in the NFPA 805 project instructions or SCE&G design guides. The objective of these documents is to provide the framework for the use of fire modeling both during the NFPA 805 transition and in the future while the plant operates under NFPA 805 licensing basis. Consistent with the fire modeling requirements in NFPA 805, these documents allow for the use of fire models that are verified and validated within a range of applications. Consequently, the fire models available for use at VCSNS when operating under NFPA 805 are not limited to the ones selected for supporting the transition. Fire models that are verified and validated (e.g., FDS, CFAST, FDTs, etc.) and are exercised within the corresponding application range may be used in the future following the process outlined in the project instructions and in accordance with the requirements of NFPA 805.

Results of Evaluation Process

Disposition of VFDRs

The VCSNS NFPA 805 transition project NSCA shutdown analysis has identified a number of VFDRs to NFPA 805 Section 4.2.3. A small number of these VFDRs were dispositioned using Performance-Based fire modeling.

Each VFDR dispositioned using a Fire Model Evaluation was assessed against the Fire Model Evaluation acceptance criteria described NFPA 805, Section 2.4.1. The results of are summarized in the detailed fire modeling calculations for each analyzed fire area (Design Calculation series DC0780B-XXX).

4.5.2.2 Fire Risk Approach

Overview of Evaluation Process

The Fire Risk Evaluations were completed as part of the VCSNS NFPA 805 transition. These Fire Risk Evaluations (FRE) were developed using the process described in the VCSNS Project Instruction, "PI 6.0 Fire Risk Evaluations." This methodology is based upon the requirements of NFPA 805, industry guidance in NEI 04-02, and RG 1.205. These are summarized in Table 4-5.

Table 4-5 Fire Risk Evaluation Guidance Summary Table

Document	Section(s)	Topic
NFPA 805 - 2001	2.2(h), 4.2.4, A.2.2(h), A.2.4.4, D.5	Change Evaluation (2.2(h), 2.2.9, 2.4.4 A.2.2(h), A.2.4.4, D.5) Risk of Recovery Actions (4.2.4) Use of Fire Risk Evaluation (4.2.4.2)
NEI 04-02 Revision 2	4.4, 5.3, Appendix B, Appendix I, Appendix J	Change Evaluation, Change Evaluation Forms (App. I), No specific discussion of Fire Risk Evaluation
RG 1.205 Revision 1	C.2.2.4, C.2.4, C.3.2	Risk Evaluations (C.2.2.4) Recovery Actions (C.2.4)

Note: Change evaluations will be used for post LAR. During transition, FREs were performed, which is the intent of the change evaluation.

During the transition to NFPA 805, selected VFDRs from Section 4.2.3 of NFPA 805 were dispositioned as a Fire Risk Evaluation per Section 4.2.4.2 of NFPA 805.

If the Fire Risk Evaluation meets the acceptance criteria of RG 1.174, this is confirmation that CDF, LERF, delta CDF, and delta LERF are sufficiently low and that the performance-based approach is acceptable per Section 4.2.4.2 of NFPA 805.

The Fire Risk Evaluation process consists of the following steps (Figure 4-7 depicts the Fire Risk Evaluation process used during transition, which is generally based on FAQ 07-0054 Revision 1):

Step 1 – Preparation for the Fire Risk Evaluation.

- Definition of the Variances from the Deterministic Requirements. The definition of the VFDR includes a description of problem statement and the section of NFPA 805 that is not met, type of VFDR (e.g., separation issue or degraded fire protection system), and proposed evaluation per applicable NFPA 805 section.
- Preparatory Evaluation – Fire Risk Evaluation Team Review. Using the information obtained during the development of the NEI 04-02 B-3 Table and the Fire PRA, a team review of the VFDR was performed. Depending on the scope and complexity of the VFDR, the team may include the Safe shutdown/NSCA Engineer, the Fire Protection Engineer, and the Fire PRA Engineer. The purpose and objective of this team review was to address the following:
  - Review of the Fire PRA modeling treatment of VFDR
  - Ensure discrepancies in the model were captured and resolved

Step 2 – Performed the Fire Risk Evaluation

- The Evaluator coordinated as necessary with the Safe Shutdown/NSCA Engineer, Fire Protection Engineer and Fire PRA Engineer to assess the VFDR using the Fire Risk Evaluation process to perform the following:
  - Change in Risk Calculation with consideration for additional risk of recovery actions and required fire protection systems and features due to fire risk.
  - Fire area change in risk summary

Step 3 – Reviewed the Acceptance Criteria

- The acceptance criteria for the Fire Risk Evaluation consist of two parts. One is quantitatively based and the other is qualitatively based. The quantitative figures of merit are ΔCDF and ΔLERF. The qualitative factors are defense-in-depth and safety margin.
  - Risk Acceptance Criteria. The transition risk evaluation was measured quantitatively for acceptability using the ΔCDF and ΔLERF criteria from RG 1.174, as clarified in RG 1.205 Regulatory Position 2.2.4.
  - Defense-in-Depth. A review of the impact of the change on defense-in-depth was performed, using the guidance from NEI 04-02.
  - Safety Margin Assessment. A review of the impact of the change on safety margin was performed.

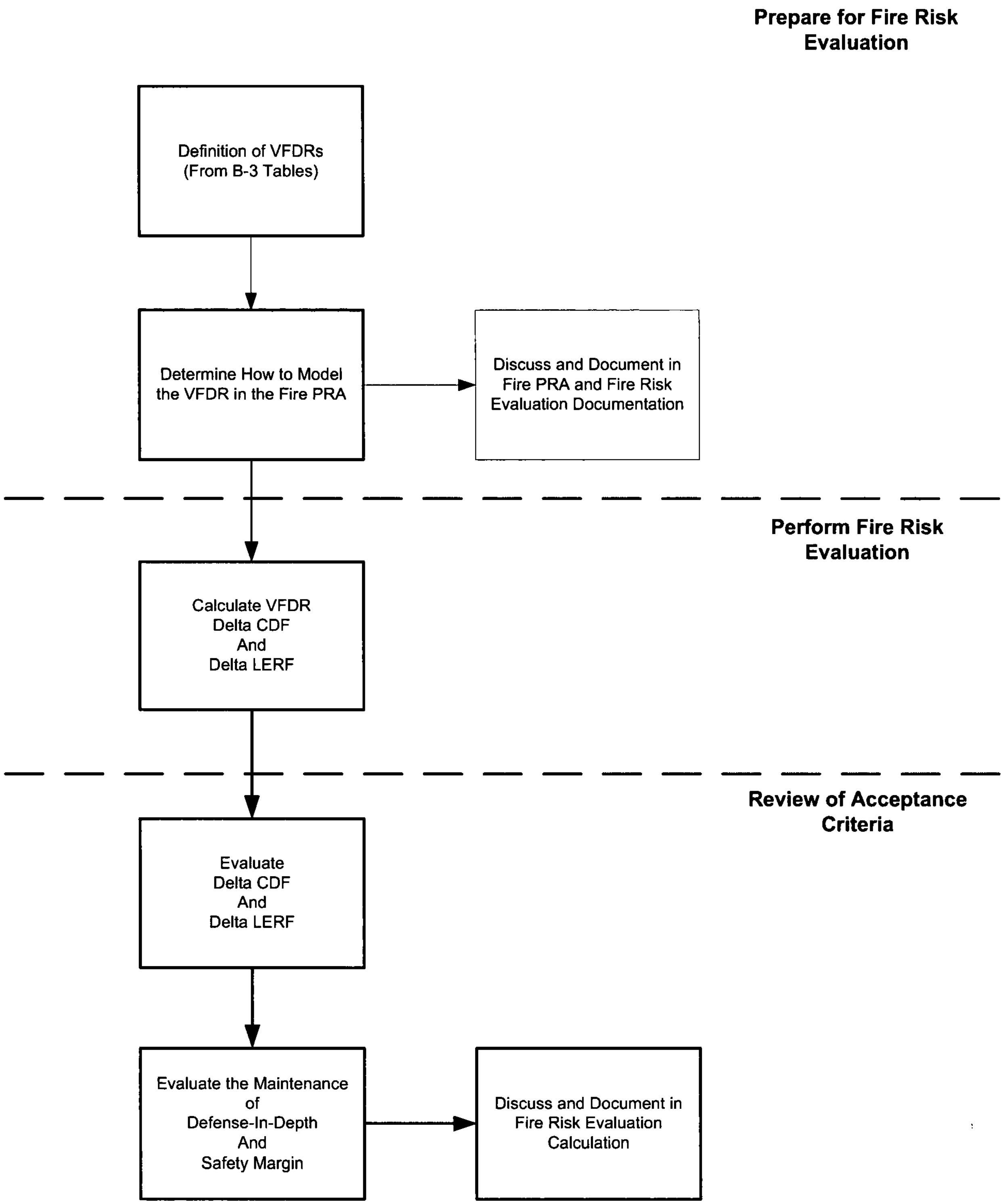

Figure 4-7 Fire Risk Evaluation Process (NFPA 805 Transition) [Based on FAQ 07-0054 Revision 1]

Results of Evaluation Process

Disposition of VFDRs

The VCSNS NFPA 805 transition project activities associated with the NSCA has identified a number of variances from the deterministic requirements of NFPA 805 Section 4.2.3. Some of these VFDRs have been dispositioned using the fire risk evaluation process.

Each variance dispositioned using a Fire Risk Evaluation was assessed against the Fire Risk Evaluation acceptance criteria of ΔCDF and ΔLERF; and maintenance of defense-in-depth and safety margin criteria from Section 5.3.5 of NEI 04-02 and RG 1.205. The results of these calculations are summarized in Attachment C.

Following completion of transition activities and planned modifications and program changes, the plant will be compliant with 10 CFR 50.48(c).

Risk Change Due to NFPA 805 Transition

In accordance with the guidance in RG 1.205, Section C.2.2.4, Risk Evaluations, risk increases or decreases for each fire area using Fire Risk Evaluations and the overall plant should be provided. Note that the risk increase due to the use of recovery actions was included in the risk change for transition for each fire area.

RG 1.205 Section C.2.2.4.2 states in part

> *"The total increase or decrease in risk associated with the implementation of NFPA 805 for the overall plant should be calculated by summing the risk increases and decreases for each fire area (including any risk increases resulting from previously approved recovery actions). The total risk increase should be consistent with the acceptance guidelines in Regulatory Guide 1.174. Note that the acceptance guidelines of Regulatory Guide 1.174 may require the total CDF, LERF, or both, to evaluate changes where the risk impact exceeds specific guidelines. If the additional risk associated with previously approved recovery actions is greater than the acceptance guidelines in Regulatory Guide 1.174, then the net change in total plant risk incurred by any proposed alternatives to the deterministic criteria in NFPA 805, Chapter 4 (other than the previously approved recovery actions), should be risk neutral or represent a risk decrease."*

The risk increases and decreases are provided in Attachment W.

4.6 Monitoring Program

4.6.1 Overview of NFPA 805 Requirements and NEI 04-02 Guidance on the NFPA 805 Fire Protection System and Feature Monitoring Program

Section 2.6 of NFPA 805 states:

> *"A monitoring program shall be established to ensure that the availability and reliability of the fire protection systems and features are maintained and to assess the performance of the fire protection program in meeting the performance criteria. Monitoring shall ensure that the assumptions in the engineering analysis remain valid."*

The intent of the monitoring review is to confirm the adequacy of the surveillance, inspection, testing, compensatory measures, and oversight processes to support the Monitoring requirement defined in NFPA 805. This process considers the following:

- Assessing the adequacy of the scope of structure, systems and components within existing plant programs
- Defining the performance criteria for the availability and reliability of the required structure, systems and components
- The adequacy of the plant corrective action program in determining causes of equipment and programmatic failures and in minimizing their recurrence

4.6.2 Overview of Post-Transition NFPA 805 Monitoring Program

This section provides an overview of the post-transition NFPA 805 monitoring program process. The monitoring program will be implemented after the safety evaluation issuance as part of the fire protection program transition to NFPA 805. The monitoring program described in this section is currently based on FAQ 10-0059 Revision 1, which has not yet been issued a closure memo. VCSNS will implement a monitoring program consistent with the NRC approved version of FAQ 10-0059.

The monitoring process is comprised of five phases.

- Phase 1 – Scoping
- Phase 2 – Screening Using Risk Criteria
- Phase 3 – Risk Target Value Determination
- Phase 4 – Monitoring Implementation
- Phase 5 – Periodic Assessment

Phase 1 – Scoping

In order to meet the NFPA 805 requirements for monitoring, the following categories of SSCs and programmatic elements will be reviewed during the implementation phase for inclusion in the NFPA 805 monitoring program:

- Structures, Systems, and Components required to comply with NFPA 805, specifically:
    - Fire protection systems and features required by the Nuclear Safety Capability Assessment
    - Fire protection systems and features modeled in the Fire PRA
    - Fire protection systems and features required by Chapter 3 of NFPA 805
    - Nuclear Safety Capability Assessment equipment
    - Structures, systems and components relied upon to meet radioactive release criteria
- Fire Protection Programmatic Elements
- Key Assumptions in Engineering Analyses (specifically analyses performed to demonstrate compliance with the nuclear safety and radioactive release performance criteria)

As a minimum the fire protection systems and features and SSCs required to meet the radioactive release criteria will be included in the existing inspection and test programs and in the system/program health program. In addition passive features (rated barriers, ERFBS), and other components (e.g. drains, curbs) that are relied upon to demonstrate compliance with Chapter 4 of NFPA 805 will also be included in the inspection and test programs, including system/program health reporting. The existing programs are adequate for routine monitoring of these SSCs. SSCs that are not addressed in the existing programs will be added.

Phase 2 – Screening Using Risk Criteria

Phase 2 of the process uses the risk significance criteria and screens the SSCs and programmatic elements to determine High Safety Significant SSCs and programmatic elements. This may be accomplished at the component, programmatic element, and/or functional level. Since risk is evaluated at the analysis unit level (e.g. fire compartment, fire area, fire scenario, ignition source), criteria must be developed to determine those analysis units for which the SSCs are considered High Safety Significant.

The Fire PRA is the primary tool used to establish the risk significance criteria and performance bounding guidelines. The screening thresholds used to determine risk significant analysis units are those that meet the following criteria:

> Risk Achievement Worth (RAW) of the monitored parameter ≥ 2.0
>
> (AND) either
>
> Core Damage Frequency (CDF) x (RAW) ≥ 1.0E-7 per year
>
> (OR)
>
> Large Early Release Frequency (LERF) x (RAW) ≥ 1.0E-8 per year

High Safety Significant (HSS) fire protection systems and features and nuclear safety capability equipment are those that meet or exceed the risk significant screening criteria. The SSCs and programmatic elements for these HSS analysis units will be included in the additional monitoring program of NFPA 805.

Low Safety Significant fire protection systems and features and nuclear safety capability equipment are those that do not meet the risk significant screening criteria and are monitored via existing programs/processes.

Additionally, the review may include other analysis units (and required FP/NSCA SSCs and programmatic elements) that are not risk significant (per the screening criteria) but are included based on plant specific history and/or operational considerations.

Documentation of the High Safety Significance fire protection systems and features and nuclear safety capability equipment will be contained in an engineering or Fire PRA controlled document.

Phase 3 – Risk Target Value Determination

Phase 3 consists of using the Fire PRA, or other processes as appropriate, to determine target values of reliability and availability for the High Safety Significant, FP/NSCA SSCs and programmatic elements established in Phase 2.

Failure criteria are established by an expert panel or evaluation based on the required fire protection and nuclear safety capability SSCs and programmatic elements assumed level of performance in the supporting analyses. Action levels are established for the SSCs at the component level, program level, or functionally through the use of the pseudo system (or functional grouping concept). The actual action level is determined based on the number of component, program or functional failures within a sufficiently bounding time period (~2-3 operating cycles). Adverse trends and unacceptable levels of availability, reliability, and performance will be reviewed against established action levels.

Documentation of the monitoring program failure criteria and action level targets will be contained in a controlled document. The basis for the criteria and action levels will be a controlled Engineering or Fire PRA evaluation. It is anticipated that the availability and reliability criterion for High Safety Significant Performance Monitoring Groups will use the guidance included in several industry documents tempered by site-specific operating experience, Fire PRA assumptions, and equipment types (and vendor data or valid design input when available). Industry documents such as the EPRI Fire Protection Equipment Surveillance Optimization and Maintenance Guide 1006756, Final Report July 2003, NFPA codes, and/or the NRC Fire Protection Significance Determination Process in addition to site specific operating experience data may be used.

Phase 4 – Monitoring Implementation

Phase 4 is the implementation of the monitoring program, once the monitoring scope and criteria are established. The corrective action process will be used to address performance of fire protection and nuclear safety SSCs that do not meet performance criteria.

For High Safety Significant fire protection and nuclear safety SSCs that are monitored, unacceptable levels of availability, reliability, and performance will be reviewed against the established action levels. If an action level is triggered, a non-conformance report or similar station document will be initiated to identify the negative trend. A corrective action plan will then be developed using an existing station process. An effective plan should improve performance, and return the SSC to above the established action level.

Phase 5 – Periodic Assessment

A periodic assessment will be documented and scheduled (e.g., at a frequency of approximately every two to three operating cycles), including, where practical, industry operating experience, and may be part of a larger assessment.

The objectives of this assessment include:

- Review Systems with performance criteria.
    - Confirm performance criteria still effectively monitor the functions of the system
    - Confirm performance criteria still monitor the effectiveness of the fire protection and nuclear safety capability assessment systems
- Configuration Control

  - Confirm via review of supporting analyses (e.g. Recent revisions) to determine if new fire protection features, NSCA SSCs, programmatic elements and/ or other functions should be added to monitoring scope
  - Confirm via review of supporting analyses (e.g. Recent revisions) to determine if the performance criteria is no longer applicable
- Trends
  - Determine if there any trends in system performance that are not being addressed, based on the performance during the assessment period.

4.7 Program Documentation, Configuration Control, and Quality Assurance

4.7.1 NFPA 805 Documentation Requirements (NFPA 805, Section 2.7.1)

In accordance with the requirements and guidance in NFPA 805 Section 2.7.1 and NEI 04-02, VCSNS has documented analyses to support compliance with 10 CFR 50.48(c). The analyses and calculations have been performed in accordance with SCE&G's processes for ensuring assumptions are clearly defined, that results are easily understood, that results are clearly and consistently described, and that sufficient detail is provided to allow future review of the entire analyses.

Documentation associated with compliance with 10 CFR 50.48(c) will be maintained for the life of the plant and organized to facilitate review for accuracy and adequacy.

The Fire Protection Program Design Basis Document described in Section 2.7.1.2 of NFPA 805 and necessary supporting documentation described in Section 2.7.1.3 of NFPA 805 have been developed as part of transition to 10 CFR 50.48(c). This documentation will be issued for use as part of program implementation following receipt of the license amendment. Appropriate cross references have been established to supporting documents as required by SCE&G.

Figure 4-8 depicts the planned post-transition documentation and relationships.

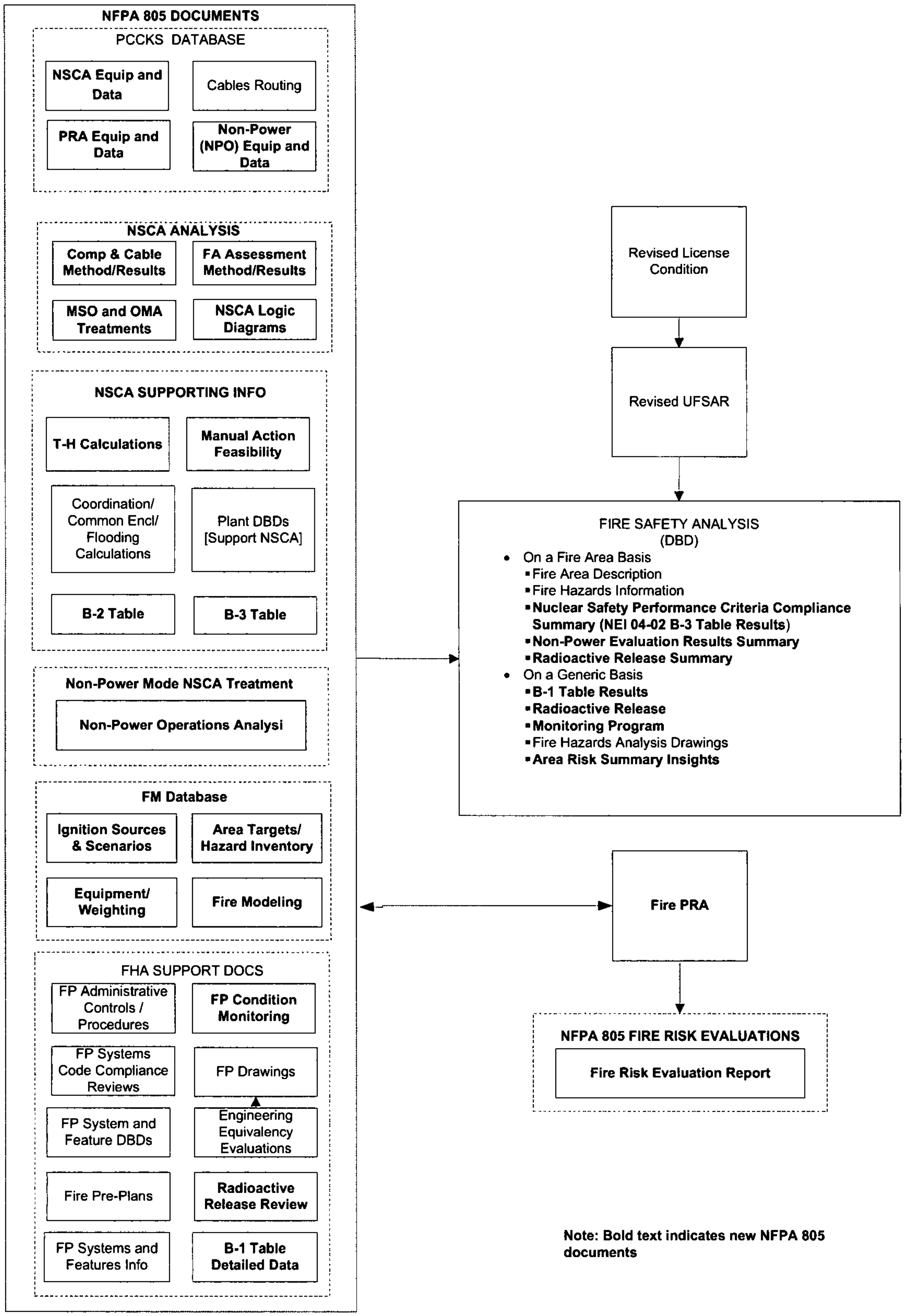

Figure 4-8 NFPA 805 Planned Post-Transition Documents and Relationships

4.7.2 NFPA 805 Configuration Management (NFPA 805, Sections 2.2.9/2.7.2)

Program documentation established, revised, or utilized in support of compliance with 10 CFR 50.48(c) is subject to SCE&G configuration control processes that meet the requirements of Sections 2.2.9 and 2.7.2 of NFPA 805. This includes the appropriate procedures and configuration control processes for ensuring that changes impacting the fire protection program are reviewed for impact. The RI-PB post transition change process methodology is based upon the requirements of NFPA 805, and industry guidance in NEI 04-02, and RG 1.205. These requirements are summarized in Table 4-6.

Table 4-6 Change Evaluation Guidance Summary Table

Document	Section(s)	Topic
NFPA 805	2.2(h), 2.2.9, 2.4.4, A.2.2(h), A.2.4.4, D.5	Change Evaluation
NEI 04-02	5.3, Appendix B, Appendix I, Appendix J	Change Evaluation, Change Evaluation Forms (Appendix I)
RG 1.205	C.2.2.4, C.3.1, C.3.2, C.4.3	Risk Evaluation, Standard License Condition, Change Evaluation Process, Fire PRA

The Plant Change Evaluation Process consists of the following 4 steps and is depicted in Figure 4-9:

- Defining/Screening the Change
- Performing the Preliminary Risk Screening
- Performing the Risk Evaluation
- Evaluating the Acceptance Criteria

Change Definition

The Change Evaluation process begins by defining the change or altered condition to be examined and the baseline configuration as defined by the Design Basis and Licensing Basis (NFPA 805 Licensing Basis post-transition).

1. The baseline is defined as that plant condition or configuration that is consistent with the Design Basis and Licensing Basis (NFPA 805 Licensing Basis post-transition).
2. The changed or altered condition or configuration that is not consistent with the Design Basis and Licensing Basis is defined as the proposed alternative.

Preliminary Risk Review

Once the definition of the change is established, a screening is then performed to identify and resolve minor changes to the fire protection program. This screening is consistent with fire protection regulatory review processes in place at nuclear plants under traditional licensing bases. This screening process is modeled after the NEI 02-03 process. This process will address most administrative changes (e.g., changes to the combustible control program, organizational changes, etc.).

The characteristics of an acceptable screening process that meets the "assessment of the acceptability of risk" requirement of Section 2.4.4 of NFPA 805 are:

- The quality of the screen is sufficient to ensure that potentially greater than minimal risk increases receive detailed risk assessments appropriate to the level of risk.
- The screening process must be documented and be available for inspection by the NRC.
- The screening process does not pose undue evaluation or maintenance burden.

If any of the above is not met, proceed to the Risk Evaluation step.

Risk Evaluation

The screening is followed by engineering evaluations that may include fire modeling and risk assessment techniques. The results of these evaluations are then compared to the acceptance criteria. Changes that satisfy the acceptance criteria of NFPA 805 Section 2.4.4 and the license condition can be implemented within the framework provided by NFPA 805. Changes that do not satisfy the acceptance criteria cannot be implemented within this framework. The acceptance criteria require that the resultant change in CDF and LERF be consistent with the license condition. The acceptance criteria also include consideration of defense-in-depth and safety margin, which would typically be qualitative in nature.

The risk evaluation involves the application of fire modeling analyses and risk assessment techniques to obtain a measure of the changes in risk associated with the proposed change. In certain circumstances, an initial evaluation in the development of the risk assessment could be a simplified analysis using bounding assumptions provided the use of such assumptions does not unnecessarily challenge the acceptance criteria discussed below.

Acceptability Determination

The Change Evaluations are assessed for acceptability using the ΔCDF (change in core damage frequency) and ΔLERF (change in large early release frequency) criteria from the license condition. The proposed changes are also assessed to ensure they are consistent with the defense-in-depth philosophy and that sufficient safety margins were maintained.

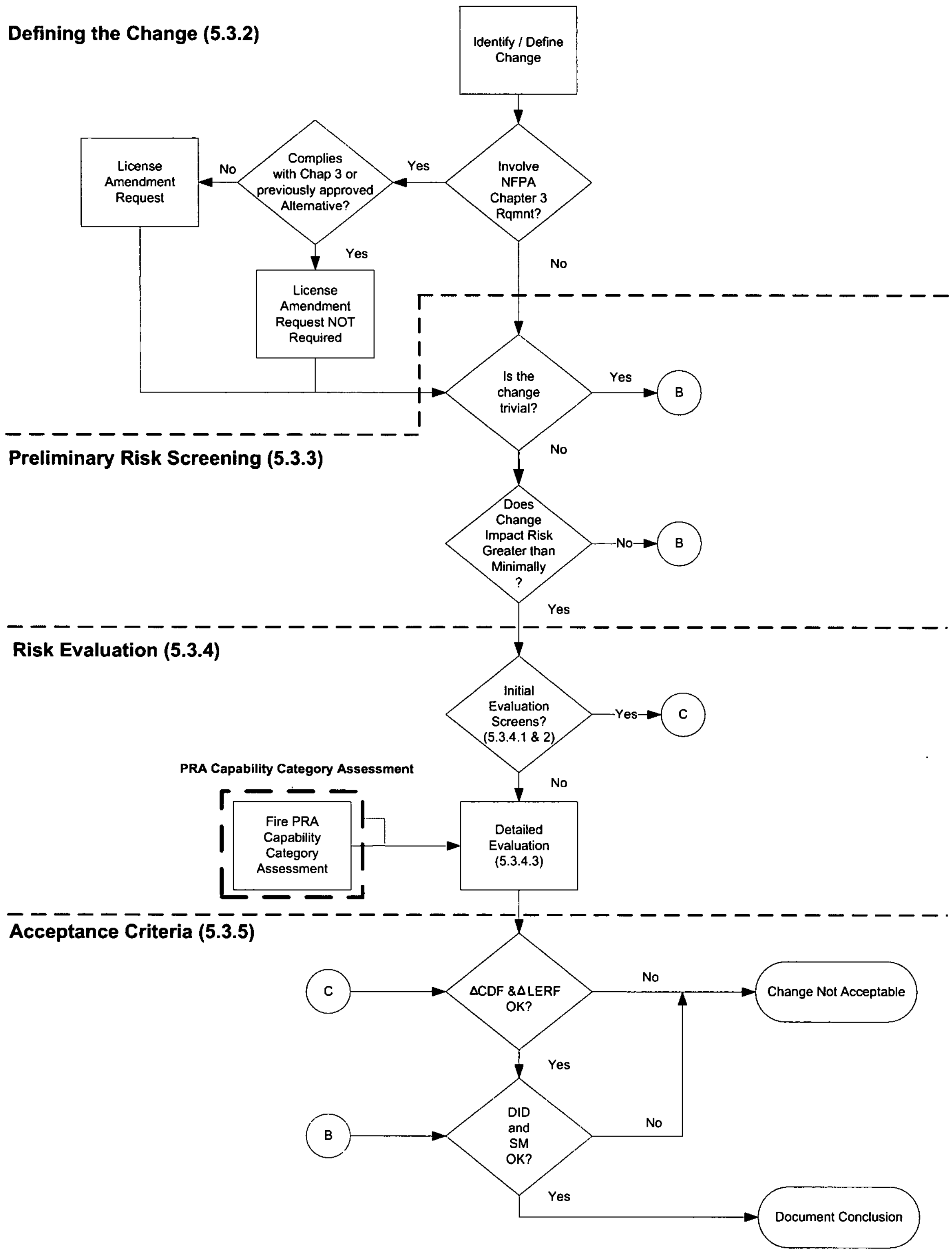

Figure 4-9 Plant Change Evaluation [NEI 04-02 Figure 5-1]
Note references in Figure refer to NEI 04-02 Sections

The VCSNS Fire Protection Program configuration is defined by the program documentation. To the greatest extent possible, the existing configuration control processes for modifications, calculations and analyses, and Fire Protection Program License Basis Reviews will be utilized to maintain configuration control of the Fire Protection program documents. The configuration control procedures which govern the various VCSNS documents and databases that currently exist will be revised to reflect the new NFPA 805 licensing bases requirements.

Several NFPA 805 document types such as: NSCA Supporting Information, Non-Power Operations Treatment, etc., generally require new control processes to be developed since they are new documents and databases created as a result of the transition to NFPA 805. The new processes will be modeled after the existing processes for similar types of documents and databases. System level design basis documents will be revised to reflect the NFPA 805 role that the system components now play.

The process for capturing the impact of proposed changes to the plant on the Fire Protection Program will continue to be a multiple step review. The first step of the review is an initial screening for process users to determine if there is a potential to impact the Fire Protection program as defined under NFPA 805 through a series of screening questions/checklists contained in one or more controlled documents depending upon the configuration control process being used. Reviews that identify potential Fire Protection program impacts will be sent to qualified individuals (Fire Protection, Safe Shutdown/NSCA, Fire PRA as applicable) to ascertain the program impacts, if any. If Fire Protection program impacts are determined to exist as a result of the proposed change, the issue would be resolved by one of the following:

- Deterministic Approach: Comply with NFPA 805 Chapter 3 and 4.2.3 requirements
- Performance-Based Approach: Utilize the NFPA 805 change process developed in accordance with NEI 04-02, RG 1.205, and the VCSNS NFPA 805 fire protection license condition to assess the acceptability of the proposed change. This process would be used to determine if the proposed change could be implemented "as-is" or whether prior NRC approval of the proposed change is required.

This process follows the requirements in NFPA 805 and the guidance outlined in RG 1.174 which requires the use of qualified individuals, procedures that require calculations be subject to independent review and verification, record retention, peer review, and a corrective action program that ensures appropriate actions are taken when errors are discovered.

4.7.3 NFPA 805 Quality Requirements (NFPA 805, Section 2.7.3)

Fire Protection Program Quality

During the transition to 10 CFR 50.48(c), VCSNS and its contract support staff performed work in accordance with the quality requirements of Section 2.7.3 of NFPA 805.

Upon receipt of the NFPA 805 Safety Evaluation, VCSNS will implement a revised Quality Assurance Program to ensure compliance with section 2.7.3 of NFPA 805 within

the prescribed implementation period. The revised Fire Protection Quality Assurance Program is based on Regulatory Position 1.7, "Quality Assurance," in RG 1.189, Rev. 2, "Fire Protection for Operating Nuclear Power Plants."

Fire PRA Quality

Configuration control of the Fire PRA model will be maintained by integrating the Fire PRA model into the existing processes described in VCSNS procedure NL-126. This is the same procedure used to ensure configuration control of the internal events PRA model. This process complies with Section 5 of the ASME Standard for PRA Quality and ensures that VCSNS maintains an as-built, as-operated PRA model of the plant. The process has been peer reviewed. Quality assurance of the Fire PRA is assured via the same processes applied to the internal events model.

This process follows the guidance outlined in RG 1.174 which requires the use of qualified individuals, procedures that require calculations be subject to independent review and verification, record retention, peer review, and a corrective action program that ensures appropriate actions are taken when errors are discovered. Although the entire scope of the formal 10 CFR 50 Appendix B program is not applied to the PRA models or processes in general, often parts of the program are applied. For instance, the procedure which addresses independent review of calculations for 10 CFR 50 Appendix B is applied to the PRA model calculations, as well.

With respect to Quality Assurance Program requirements for independent reviews of calculations and evaluations, those existing requirements for Fire Protection Program documents will remain unchanged.

Quality: Uncertainty/Sensitivity

As recommended by NUREG/CR-6850, the sources of uncertainty in the Fire PRA were identified and specific parameters were analyzed for sensitivity in support of the NFPA 805 FRE process.

Specifically with regard to uncertainty, uncertainties associated with PRA assumptions and plant modifications associated with the project have been evaluated with sensitivity studies. These results are contained in VSCNS Design Calculation DC00340-001, Attachment 13, "FPRA Sensitivity and Uncertainty Report." In addition, sensitivity to uncertainty associated with fire initiating event frequencies is discussed in VCSNS Technical Report TR07800-007, "Fire PRA Ignition Frequency Analysis." Uncertainties associated with Fire Scenario Selection are associated in the notebooks for individual scenarios.

Quality: Conservatism

While the removal of conservatism inherent in the Fire PRA is a long-term goal, the Fire PRA results were deemed sufficient for evaluating the risk associated with this application. While VCSNS continues to strive toward a more "realistic" estimate of fire risk, use of mean values continues to be the best estimate of fire risk. During FRE process, the uncertainty and sensitivity associated with specific Fire PRA parameters were considerations in the evaluation of the change in risk relative to the applicable acceptance thresholds.

Specific Quality Attributes (NFPA 805, Section 2.7.3)

Review (NFPA 805, Section 2.7.3.1)

Analyses, calculations, and evaluations performed in support of compliance with 10 CFR 50.48(c) were performed in accordance with VCSNS procedures that require independent review.

Verification and Validation (NFPA 805, Section 2.7.3.2)

Models and numerical methods used in support of compliance with 10 CFR 50.48(c) were verified and validated as required by Section 2.7.3.2 of NFPA 805.

Limitations of Use (NFPA 805, Section 2.7.3.3)

Engineering methods and numerical models used in support of compliance with 10 CFR 50.48(c) were and are used with the same limitations and assumptions supported by the V&V for the methods as required by Section 2.7.3.3 of NFPA 805.

Qualification of Users (NFPA 805, Section 2.7.3.4)

Cognizant personnel who use and apply engineering analysis and numerical methods in support of compliance with 10 CFR 50.48(c) was competent and experienced as required by Section 2.7.3.4 of NFPA 805. This requirement will continue to be met by adherence to SCE&G procedures and project management of contractor support staff.

For personnel performing fire modeling or Fire PRA development and evaluation, VCSNS and contract personnel developed and maintained project instructions to be used by individuals assigned various tasks, to ensure consistency of the engineering and PRA products. These instructions were developed by personnel with intimate knowledge and experience in the task subject matter. Task specific instructions were developed to identify and document required training and mentoring to ensure individuals are appropriately qualified per the requirements of NFPA 805 Section 2.7.3.4 to perform assigned work.

Uncertainty Analysis (NFPA 805, Section 2.7.3.5)

The impact of important uncertainties on the Fire PRA results was established using extensive, well formulated sensitivity studies to provide reasonable assurance that the performance criteria have been met as outlined in Section A of 2.7.3.5 of NFPA 805.

4.8 Summary of Results

4.8.1 Results of the Fire Area Review

A summary of the NFPA 805 compliance basis for each fire area is provided in Table 4-7. The table provides the following information from the NEI 04-02 Table B-3:

- Fire Area: Fire Area Identifier.
- Description: Fire Area Description.
- NFPA 805 Compliance Basis: Post-transition NFPA 805 Chapter 4 compliance basis.

The approach to performing the fire area reviews were done on a DROID by DROID basis. Deterministic based solutions were initially identified to disposition DROIDs. However, performance-based solutions were also selected on a case by case basis to

resolve DROIDs. If a given fire area has one performance based solution, then the overall area classification identified in Table 4-7 is performance-based. If all solutions were deterministic, then the overall classification is deterministic.

Table 4-7 Fire Area NFPA 805 Compliance Basis

Fire Area	Description	NFPA 805 Compliance Basis
AB01	AB General Area, All Elevations (ex WPAA)	NFPA 805 Section: 4.2.4 – Performance-Based Approach
CB01	CB General Area 412, 425 West	NFPA 805 Section: 4.2.4 – Performance-Based Approach
CB02	CB East Chase 400, 412 B Train	NFPA 805 Section: 4.2.4 – Performance-Based Approach
CB03	CB West Chase 400, 412	NFPA 805 Section: 4.2.4 – Performance-Based Approach
CB04	CB East Lower Cable Spreading 425	NFPA 805 Section: 4.2.4 – Performance-Based Approach
CB05	CB East Chase 400, 412 B Train	NFPA 805 Section: 4.2.4 – Performance-Based Approach
CB06	CB Relay Room	NFPA 805 Section: 4.2.4 – Performance-Based Approach
CB07	CB Plant Computer Room	NFPA 805 Section: 4.2.3 – Deterministic Approach
CB08	CB General Area West/ West Chase 436, 448	NFPA 805 Section: 4.2.3 – Deterministic Approach
CB10	CB East Chase 436	NFPA 805 Section: 4.2.4 – Performance-Based Approach
CB12	CB NE Chase 436	NFPA 805 Section: 4.2.4 – Performance-Based Approach
CB14	CB Security Computer Room	NFPA 805 Section: 4.2.3 – Deterministic Approach
CB15	CB Upper Cable Spreading Room	NFPA 805 Section: 4.2.4 – Performance-Based Approach
CB17	CB Control Room/ Support Area	NFPA 805 Section: 4.2.4 – Performance-Based Approach
CB18	CB East Chase 463	NFPA 805 Section: 4.2.4 – Performance-Based Approach
CB20	CB NE Chase 463	NFPA 805 Section: 4.2.4 – Performance-Based Approach
CB22	CB HVAC Room A	NFPA 805 Section: 4.2.4 – Performance-Based Approach
CB23	CB HVAC Room B	NFPA 805 Section: 4.2.4 – Performance-Based Approach
CWPH01	CWPH Electric Fire Pump Room	NFPA 805 Section: 4.2.3 – Deterministic Approach
CWPH02	CWPH Diesel Fire Pump Room	NFPA 805 Section: 4.2.3 – Deterministic Approach
CWPH03	CWPH Circ Water Pump Area (Outdoor)	NFPA 805 Section: 4.2.3 – Deterministic Approach
DB	Underground Duct Bank (Conduits only)	NFPA 805 Section: 4.2.3 – Deterministic Approach
DG01	DG Diesel Generator A, All Elevations	NFPA 805 Section: 4.2.3 – Deterministic Approach
DG02	DG Diesel Generator B, All Elevations	NFPA 805 Section: 4.2.3 – Deterministic Approach
FH01	FH General Area, All Elevations	NFPA 805 Section: 4.2.3 – Deterministic Approach
IB01	IB Battery Room X 412	NFPA 805 Section: 4.2.3 – Deterministic Approach
IB02	IB Battery Room A 412	NFPA 805 Section: 4.2.3 – Deterministic Approach
IB03	IB Battery Charger Room A 412	NFPA 805 Section: 4.2.3 – Deterministic Approach

Table 4-7 Fire Area NFPA 805 Compliance Basis

Fire Area	Description	NFPA 805 Compliance Basis
IB04	IB Battery Charger Room B 412	NFPA 805 Section: 4.2.3 – Deterministic Approach
IB05	IB Battery Charger Room A/B 412	NFPA 805 Section: 4.2.4 – Performance-Based Approach
IB06	IB Battery Room B 412	NFPA 805 Section: 4.2.3 – Deterministic Approach
IB07	IB Chilled Water Pump Rooms 412	NFPA 805 Section: 4.2.3 – Deterministic Approach
IB08	IB HVAC Chiller Room C 412	NFPA 805 Section: 4.2.3 – Deterministic Approach
IB09	IB HVAC Chiller Room B 412	NFPA 805 Section: 4.2.3 – Deterministic Approach
IB10	IB Battery Room Ventilation A 423	NFPA 805 Section: 4.2.4 – Performance-Based Approach
IB11	IB SWBP Cooling Unit Room B	NFPA 805 Section: 4.2.4 – Performance-Based Approach
IB12	IB Speed Switch Room B	NFPA 805 Section: 4.2.4 – Performance-Based Approach
IB13	IB Speed/ XFR Switch Room "C"	NFPA 805 Section: 4.2.4 – Performance-Based Approach
IB14	IB CREP Room A	NFPA 805 Section: 4.2.4 – Performance-Based Approach
IB15	IB CREP Room B	NFPA 805 Section: 4.2.4 – Performance-Based Approach
IB16	IB ESF SWGR Cooling Unit Room A	NFPA 805 Section: 4.2.3 – Deterministic Approach
IB17	IB ESF SWGR Cooling Unit Room B	NFPA 805 Section: 4.2.4 – Performance-Based Approach
IB18	IB Speed Switch Cooling Unit Room A	NFPA 805 Section: 4.2.3 – Deterministic Approach
IB19	IB Speed Switch Cooling Unit Room B	NFPA 805 Section: 4.2.3 – Deterministic Approach
IB20	IB 1DA Switchgear Room	NFPA 805 Section: 4.2.4 – Performance-Based Approach
IB21	IB CRDM Switchgear Room	NFPA 805 Section: 4.2.4 – Performance-Based Approach
IB22	IB 1DB Switchgear (436)/ Ventilation Room 423	NFPA 805 Section: 4.2.4 – Performance-Based Approach
IB23	IB A Chiller (412)/ SWBP Cooling (423)/ A Speed Switch Rooms (436)	NFPA 805 Section: 4.2.3 – Deterministic Approach
IB24	IB Reactor Protection Panel Room	NFPA 805 Section: 4.2.3 – Deterministic Approach
IB25	IB General Area 412, 436/ WPAA 463	NFPA 805 Section: 4.2.4 – Performance-Based Approach
IB26	IB Electrical Chase 451 SE	NFPA 805 Section: 4.2.3 – Deterministic Approach
IB27	IB Diesel Generator B Cable Chase	NFPA 805 Section: 4.2.4 – Performance-Based Approach
MH02	B train of MH02	NFPA 805 Section: 4.2.3 – Deterministic Approach
MH08	Manhole Yard North	NFPA 805 Section: 4.2.3 – Deterministic Approach
MH36	Manhole Yard TBD	NFPA 805 Section: 4.2.3 – Deterministic Approach
RB01	RB General Area, All Elevations	NFPA 805 Section: 4.2.4 – Performance-Based Approach
SWPH01	SWPH Elect Equip Room A	NFPA 805 Section: 4.2.3 – Deterministic Approach
SWPH02	SWPH Elect Equip Room C	NFPA 805 Section: 4.2.3 – Deterministic Approach
SWPH03	SWPH Elect Equip Room B	NFPA 805 Section: 4.2.4 – Performance-Based Approach
SWPH04	SWPH Ventilation Duct Room	NFPA 805 Section: 4.2.4 – Performance-Based Approach

Table 4-7 Fire Area NFPA 805 Compliance Basis

Fire Area	Description	NFPA 805 Compliance Basis
SWPH05	SWPH Service Water Pump Area (436)/ Valve Pit Room (425)	NFPA 805 Section: 4.2.4 – Performance-Based Approach
SWPH06	SWPH Cable Chase	NFPA 805 Section: 4.2.3 – Deterministic Approach
SWYD01	Electrical Switchyard (Outdoor)	NFPA 805 Section: 4.2.3 – Deterministic Approach
TB01	TB General Area, All Elevations	NFPA 805 Section: 4.2.4 – Performance-Based Approach
TB02	TB Switchgear Room 412	NFPA 805 Section: 4.2.4 – Performance-Based Approach
TB03	TB Switchgear Room 436	NFPA 805 Section: 4.2.3 – Deterministic Approach
TB05	TB Switchgear Room 463	NFPA 805 Section: 4.2.3 – Deterministic Approach
YD01	Refueling Wtr and Makeup Wtr Tank Area (Outdoor)	NFPA 805 Section: 4.2.4 – Performance-Based Approach
YD02	Yard East of Plant (Outdoor)	NFPA 805 Section: 4.2.3 – Deterministic Approach
YD03	Station Transformer Area	NFPA 805 Section: 4.2.3 – Deterministic Approach

4.8.2 Required Fire Protection System/Feature

Detection / suppression "required" for a given Fire Area is based on NFPA 805 Chapter 4 compliance. The criteria are summarized below.

- S – Separation Criteria: Systems/Features required for Chapter 4 Separation Criteria in Section 4.2.3
- R – Risk Criteria: Systems/Features required to meet the Risk Criteria for the Performance-Based Approach (Section 4.2.4)
- E – EEEE/LA Criteria: Systems/Features credited to support the acceptability of deviations found in Fire Protection Engineering Equivalency Evaluations / NRC approved Licensing Action (i.e., Exemptions/Deviations/Safety Evaluations) (Section 2.2.7)
- D – Defense-in-depth Criteria: Systems/Features required to maintain adequate balance of Defense-in-Depth for a Performance-Based Approach (Section 4.2.4)

The guidance used in the selection or "required" Fire Protection Systems/Features have been included in Table 4-8. A summary of the "required" fire suppression and detection systems have been included in Tables 4-9 and 4-10.

The detailed listings of other required features (e.g. ERFBS, Fire Hose Stations, and Fire Hydrants) are available in controlled engineering documents. The selection of these features has been made consistent with the guidance provided by Table 4-8, or other guidance provided by NFPA 805.

The High Safety Significant (HSS) FP Systems/features are designated via the process defined in Section 4.6.2 of the Transition Report, as part of the Monitoring Program, and developed based on the NRC/NEI endorsed FAQ 10-0059 for defining these systems and features.

Attachment W contains the results of the Fire Risk Evaluations (including additional risk of recovery actions) and the change in risk on a fire area basis.

Conditions for defining a Required Fire Protection System or feature shall assure that open issues or items where full, 3 hour separation (deterministic) cannot be achieved, and that the solution defines the appropriate system or feature to be required for alternative compliance approaches permitted by NFPA 805.

Table 4-8 Required Fire Protection System Basis

Fire Protection Feature	Deterministic (4.2.3) (NSCA)	Performance-Based (4.2.4) (Fire PRA/ Fire Model/ FRE)	Engineering Evaluation
Fire Barriers	• 3 hr rated barrier for separation of redundant trains of equipment (4.2.3.2) • 3 hr enclosure of redundant System & Components (4.2.3.3.a) • 1 hr enclosure of redundant System & Components (4.2.3.3.c) • ½ hr radiant energy shield (4.2.3.4(b))	• Controlled Fire Area envelop for a Performance-based fire model • Credited Fire Rated barrier in the Base Fire PRA or Fire Risk Evaluation (e.g. required to meet the acceptance criteria of RG1.174 guidelines)	• Fire Area/ Zone boundaries where qualitative assessments are made regarding adequacy of separation by physical barriers and construction.
Fire Detection	• Required to support area spatial (20 ft) separation (4.2.3.3 (b)) • Required to support area 1 hour separation (4.2.3.3 (c)) • Credited for containment separation issue(4.2.3.4(c))	• Fire Detection system that is specifically credited in the Base Fire PRA or performance-based evaluation(e.g. required to meet the acceptance criteria of RG1.174 guidelines)	• Fire Protection System or feature credited in an Engineering Evaluation
Fire Suppression	• Required to support area spatial (20 ft) separation (4.2.3.3 (b)) • Required to support area 1 hour separation (4.2.3.3 (c)) • Credited for containment separation issue(4.2.3.4(c)) • Required by NFPA 805-2001 (e.g. Section 3.9.4)	• Fire Suppression System that is specifically credited in the Base Fire PRA or performance-based evaluation (e.g. required to meet the acceptance criteria of RG1.174 guidelines)	• Fire Protection System or feature credited in an Engineering Evaluation
Hose Station	• Hose stations in any area which are used to protect equipment in the NSCA model	• Hose stations in any area which are used to protect equipment in the Fire PRA model (e.g. required to meet the acceptance criteria of RG1.174 guidelines)	• Fire Protection System or feature credited in an Engineering Evaluation
Fire Hydrants	• Fire Hydrants/ associated equipment used as the primary means to support manual fire fighting activities (water)	• Fire Hydrants/ associated equipment used as the primary means to support manual fire fighting activities (water)	• Fire Protection System or feature credited in an Engineering Evaluation

Table 4-8 Required Fire Protection System Basis

Fire Protection Feature	Deterministic (4.2.3) (NSCA)	Performance-Based (4.2.4) (Fire PRA/ Fire Model/ FRE)	Engineering Evaluation
ERFBS	• Credit being taken for separation of the affected equipment/ circuits by an ERFBS having a 3 hour (4.2.3.3(a)) or 1 hour (4.2.3. 3(c)) fire resistance rating • For containment separation issues, a ½ hr radiant energy shield (4.2.3.4(b)) or rated enclosure (4.2.3.4(b))	• Credit being taken in the Base Fire PRA or Performance-based evaluation for separation of the affected equipment/ circuits by a qualified ERFBS (e.g. required to meet the acceptance criteria of RG1.174)	• Fire Protection System or feature credited in an Engineering Evaluation

Notes:

1. The scope of **Evaluations** includes Fire Protection Engineering Equivalency Evaluations (2.2.7) and Defense in Depth discussions in Change Evaluations (2.4.4). In each case the FP system or feature becomes "required" when the system or feature is credited for supporting analysis conclusions (e.g. Defense in Depth, Supporting basis).
2. Definition of a required FP system or feature implies compliance with the associated NFPA 805 Chapter 3 requirements.
3. A system or feature becomes "Required", when resolution is achieved by crediting one or more of these solutions on a fire zone or area basis.
4. Refer to Attachment C for each fire area or zone, for identification of specific of "Required" FP systems and features.

Table 4-9 Summary of NFPA 805 Required Suppression Systems

Fire Area / Fire Zone	Protected Area Description	General System Description	Reference Drawings	Required			Comments / References
				NSCA	Performance-Based	Engineering Evaluation	
Auxiliary Building							
AB.01	**Fire Area AB01**	**Fire Area Assessment**					
AB01.01	Gen Fl Area AB374	None	None	S			Suppression "throughout fire area" TR0780E-001
AB01.02	RHR Pump Rm A AB374	None	None	S			Suppression "throughout fire area" TR0780E-001
AB01.03	RHR Pump Rm B AB374	None	None	S			Suppression "throughout fire area" TR0780E-001
AB01.04	General Corridor Area/ Shield Slab, AB388 AB400	None	None	S			Suppression "throughout fire area" TR0780E-001
AB01.06	AB Charging Pump Rm C, AB388	None	None	S			Suppression "throughout fire area" TR0780E-001
AB01.08.01	Recirc Valve Area North, AB397	None	None	S			Suppression "throughout fire area" TR0780E-001
AB01.08.02	Recirc Valve Area South, AB397	None	None	S			Suppression "throughout fire area" TR0780E-001
AB01.09	Charging Pump HVAC Slab, AB400	Preaction system, el 400', Charging Pump HVAC Area XVM-03428-FS	1MS-55-137	S		E	Partial Suppression for Room TR0780E-002, ECR50810

Table 4-9 Summary of NFPA 805 Required Suppression Systems

Fire Area / Fire Zone	Protected Area Description	General System Description	Reference Drawings	Required NSCA	Required Performance-Based	Required Engineering Evaluation	Comments / References
AB01.21.01	Cable Tray Area South, AB463	Preaction system, el.463' South, Valve XVM-6940-FS	1MS-55-137-4	S		E	Penetration Seals - AB423/CB423 - TR07870-002
AB01.21.02	General Floor Area North, AB463	Preaction system, el.463' South, Valve XVM-6940-FS	1MS-55-137-4	S		E	Penetration Seals - AB2145 - TR07870-002
Control Building							
CB01.01	North East Cable Chase, General Floor Area (Below Ceiling) CB412	Wet-pipe system, el.412', Valve XVM-4105-FS	1MS-55-085-25	S			
CB01.01	North East Cable Chase, CB412	Preaction system, Cable Chases, el.412', Valve XVM-4065-FS	1MS-55-085-10, 1MS-55-085-11, 1MS-55-085-14	S			
CB01.02	Office Area West, CB425	Preaction system, Cable Spreading Areas, el.425', Valve XVM-4065-FS	1MS-55-085-10, 1MS-55-085-11	S			
CB02	East Cable Chase, CB412	Preaction system, Cable Chases, el.412', Valve XVM-4065-FS	1MS-55-085-10, 1MS-55-085-11, 1MS-55-085-14	S			
CB04	Lower Cable Spreading Room, CB425	Preaction system, Cable Spreading Areas, el.425', Valve XVM-4065-FS	1MS-55-085-10, 1MS-55-085-11		R		
CB05	East Cable Room & Pit Area CB 400'&412"	Preaction Sprinkler System, 400', 412'	1MS-55-085-14	S			
CB06	Relay Room,	CO2, Relay Rm, el.436', Room	1MS-55-040		R		

Table 4-9 Summary of NFPA 805 Required Suppression Systems

Fire Area / Fire Zone	Protected Area Description	General System Description	Reference Drawings	Required			Comments / References
				NSCA	Performance-Based	Engineering Evaluation	
	CB436	36-11	Sh.09				
CB10	East Cable Chase, CB436	Preaction system, Cable Chases, el.436', Valve XVM-4065-FS	1MS-55-085-10, 1MS-55-085-12, 1MS-55-085-14	S	R	E	Penetration Seals - CB891 - TR07870-002
CB12	Northeast Cable Chase, CB 436	Preaction system, Cable Chases, el.436', Valve XVM-4065-FS	1MS-55-085-10, 1MS-55-085-12, 1MS-55-085-14	S	R	E	Penetration Seals - CB1082, AB91/CB91 -TR07870-002
CB15	Upper Cable Spreading Room, CB 448	Preaction system, Cable Chases, el.463', Valve XVM-4065-FS	1MS-55-085-12		R	E	Penetration Seals - CB891, CB1082 - TR07870-002
CB18	East Cable Chase, CB463	Preaction system, Cable Chases, el.463', Valve XVM-4065-FS	1MS-55-085-10, 1MS-55-085-13, 1MS-55-085-14		R		
CB20	North East Cable Chase, CB463	Preaction system, Cable Chases, el.463', Valve XVM-4065-FS	1MS-55-085-10, 1MS-55-085-13, 1MS-55-085-14			E	Penetration Seal - CB423/AB423 - TR07870-002
Circulating Water Pump House							
CWPH02	Diesel Fire Pump Room CWPH02	Wet-pipe system, Diesel fire pump room, Valve XVG06817-FS Room 36-02)	1MS-55-085-26			E	Required by NFPA 805 Section 3.9.4.
Fuel Handing Building							
FH01	**Fire Area FH01**	**Fire Area Assessment**					
FH01.03	FH Gen Fl Area & Tank Rooms 412 & 436	None	None	S			Suppression "throughout fire area" TR0780E-001
FH01.04	FH Operating Fl 436	None	None	S			Suppression "throughout fire

Table 4-9 Summary of NFPA 805 Required Suppression Systems

Fire Area / Fire Zone	Protected Area Description	General System Description	Reference Drawings	Required NSCA	Required Performance-Based	Required Engineering Evaluation	Comments / References
							area" TR0780E-001
Intermediate Building							
IB07.01	Chilled Water Pump Area South, IB412	Preaction system, 412' Chilled Water Pump A, Valve XVM-6935-FS	1MS-55-137-5, 1MS-55-137-6, 1MS-55-137-6A	S			Separation between Pumps, TR0780E-001
IB07.02	Chilled Water Pump Area North, IB412	Preaction system, 412' Chilled Water Pump B, Valve XVM-6935-FS	1MS-55-137-5, 1MS-55-137-6, 1MS-55-137-6A	S			Separation between Pumps, TR0780E-001
IB07.03	Chilled Water Pump Area Central, IB412	Preaction system, 412' Chilled Water Pump C, Valve XVM-6935-FS	1MS-55-137-5, 1MS-55-137-6, 1MS-55-137-6A	S			Separation between Pumps, TR0780E-001
IB 25	**Fire Area IB25**	**Fire Area Assessment**					
IB25.01.01	SW Booster Pump A, (Below Suspended Barrier) West, IB 412	Preaction system, 412' and 436' SW, Valve XVM-6935-FS	1MS-55-137-5, 1MS-55-137-6, 1MS-55-137-6A	S			Separation between Pumps,TR0780E-001
IB25.01.02	General Floor Area West, IB412	Preaction system, 412' and 436' SW, Valve XVM-6935-FS	1MS-55-137-5, 1MS-55-137-6, 1MS-55-137-6A	S	R		Separation between Pumps,TR0780E-001
IB25.01.03	General Floor Area East, IB412	Preaction system, 412' and 436' SW, Valve XVM-6935-FS	1MS-55-137-5, 1MS-55-137-6, 1MS-55-137-6A	S	R		Separation between Pumps,TR0780E-001
IB25.01.04	Outside Turbine EFW East Area, IB 412	Preaction system, 412' and 436' SW, Valve XVM-6935-FS	1MS-55-137-5, 1MS-55-137-6, 1MS-55-137-6A	S			

Table 4-9 Summary of NFPA 805 Required Suppression Systems

Fire Area / Fire Zone	Protected Area Description	General System Description	Reference Drawings	Required NSCA	Required Performance-Based	Required Engineering Evaluation	Comments / References
IB25.01.05	General Floor Area Central, IB412	Preaction system, 412' and 436' SW, Valve XVM-6935-FS	1MS-55-137-5, 1MS-55-137-6, 1MS-55-137-6A	S	R		Separation between Pumps,TR0780E-001
IB25.03.01	General Area EPAA North, EPAA412	None	None	S			Suppression "throughout fire area" TR0780E-001
IB25.03.02	General Area EPAA South, EPAA412	None	None	S			Suppression "throughout fire area" TR0780E-001
IB25.06.01	General MSIV Area Room 36-02	None	None	S			Suppression "throughout the area" TR0780E-001
IB25.06.02	General Area Room 36-02W	Preaction system, 436' , Valve XVM-6935-FS	1MS-55-137-5			E	Penetration Seal - IB183 TR07870-002
IB25.07	General Area South Room 36-02	None	None	S			Suppression "throughout the area" TR0780E-001
Service Water Pump House							
SWPH05.01.01	Service Water Pump Discharge Valve Area, SWPH425	None	None	S			Separation & Suppression TR0780E-001
SWPH05.01.02	Service Water Pump Discharge Valve Area, SWPH425	None	None	S			Separation, Detection & Suppression TR0780E-001

Table 4-9 Summary of NFPA 805 Required Suppression Systems

Fire Area / Fire Zone	Protected Area Description	General System Description	Reference Drawings	Required NSCA	Required Performance-Based	Required Engineering Evaluation	Comments / References
SWPH05.01.03	Service Water Pump Discharge Valve Area, SWPH425	None	None	S			Separation, Detection & Suppression TR0780E-001
SWPH05.02.01	SWPH Pump Rm A South 436	Preaction System, Service Water Pumphouse 436' & 441', Valve XVM-6942-FS	1MS-55-137-1	S			Separation, TR0780E-001
SWPH05.02.02	SWPH Pump Rm C Center 436	Preaction System, Service Water Pumphouse 436' & 441', Valve XVM-6942-FS	1MS-55-137-1	S			Separation, TR0780E-001
SWPH05.02.03	SWPH Pump Rm B North 436	Preaction System, Service Water Pumphouse 436' & 441', Valve XVM-6942-FS	1MS-55-137-1	S			Separation, TR0780E-001
Yard Areas							
YD02.01	Condensate Storage Tank - South Side	None	None	S			Suppression "throughout fire area" TR0780E-001
YD02.02	Condensate Storage Tank - North Side	None	None	S			Suppression "throughout fire area" TR0780E-001

Table 4-10 Summary of NFPA 805 Required Detection Systems

Fire Area / Fire Zone	Protected Area Description	Required			Comments / References
		NSCA	Performance-Based	Engineering Evaluation	
Auxiliary Building					
AB.01	**Fire Area Assessment**				
AB01.01.01	Auxiliary Bldg, el.374', Room 74-09S	S			Separation TR0780E-001
AB01.01.02	Auxiliary Bldg, el.374', Room 74-09NE, -11, -12, -13, -14	S			Separation TR0780E-001
AB01.01.03	Auxiliary Bldg, el.374', Rooms 74-01, -07, -08, -09N, -09W and -18	S			Separation TR0780E-001
AB01.02	Auxiliary Bldg, el.374', Room 74-17	S			Separation TR0780E-001
AB01.03	Auxiliary Bldg, el.374', Room 74-16	S			Separation TR0780E-001
AB01.04	Auxiliary Bldg, el.388', Rooms 88-05, -05E, -05W, -13, -13N, -13S, -13NE and -16	S	R		Separation TR0780E-001
AB01.04	Auxiliary Bldg, el.397', Room 97-01	S	R		Separation TR0780E-001
AB01.04	Auxiliary Bldg, el.400', Rooms 00-01, 00-01E, and 00-01W	S	R		Separation TR0780E-001
AB01.06	Auxiliary Bldg, el.388', Room 88-24	S			Separation TR0780E-001
AB01.08.01	Auxiliary Bldg, el.397', Room 97-02S	S			Separation TR0780E-001
AB01.08.02	Auxiliary Bldg, el.397', Rooms 97-02, -02N	S	R		Separation TR0780E-001
AB01.09	Auxiliary Bldg, el.400', Room 00-02E	S	R		Separation TR0780E-001
AB01.10	Auxiliary Bldg, el.412', Rooms 12-09, 12-28, 26-02E, 26-02W		R		
AB01.10	Auxiliary Bldg, el.412', Rooms 12-11, 12-11N		R		
AB01.10	Auxiliary Bldg, el.426', Rooms 26-01, -02E,		R		

Table 4-10 Summary of NFPA 805 Required Detection Systems

Fire Area / Fire Zone	Protected Area Description	Required			Comments / References
		NSCA	Performance-Based	Engineering Evaluation	
	-02W				
AB01.17	Auxiliary Bldg, el.412', Rooms 12-02, -03A		R		
AB01.18.01	Auxiliary Bldg, el.436', Rooms 36-18, -17E		R	E	Penetration Seals -AB114/IB114(36-18) - TR07870-002
AB01.18.02	Auxiliary Bldg, el.436', Rooms 36-01, -03, -31, -33		R	E	Penetration Seal - CB91/AB91 (AB36-31) TR07870-002
AB01.18.02	Auxiliary Bldg, el.446' & 448', Rooms 46-01, 48-01		R		
AB01.18.02	Auxiliary Bldg, el.452', Rooms 52-01, -02		R		
AB01.21.01	Auxiliary Bldg, el.463', Room 63-19	S	R		Separation TR0780E
AB01.21.02	Auxiliary Bldg, el.463', Rooms 63-04, -07, -14, -16, and -17	S	R		Separation TR0780E
AB01.21.02	Auxiliary Bldg, el.463', Room 63-09	S	R	E	Penetration Seal - AB423/CB423, AB 2145 (63-16) - TR07870-002
AB01.29	Auxiliary Bldg, el.463', Room 63-01		R	E	Penetration Seal - AB2145 TR07870-002
AB01.30	Auxiliary Bldg, el.485', Room 85-01, -02, and -03	S			
Control Building					
CB01.01	Control Bldg, el.412', Cable Chase, Rooms 12-03, -11	S	R		
CB01.01	Control Bldg, el.412', 12 -03 (above ceiling)	S	R		
CB01.02	Control Bldg, el.425', Rooms 25-01, -03, -04	S			
CB02	Control Bldg, el.400' & 412', Cable Chase, Rooms 00-01A & 12-04	S	R		

Table 4-10 Summary of NFPA 805 Required Detection Systems

Fire Area / Fire Zone	Protected Area Description	Required NSCA	Required Performance-Based	Required Engineering Evaluation	Comments / References
CB04	Control Bldg, el.425', Room 25-02		R		
CB05	Control Bldg, el.400' & 412', Cable Chase, Rooms 00-01 & 12-04A	S	R		
CB06	Control Bldg, el.436', Room 36-11		R		
CB08.05	Control Bldg, el. 448', Room 48-01A			E	Penetration Seal -CB228 - TR07870-002
CB10	Control Bldg, el.436', Cable Chase, Room 36-04	S	R	E	Penetration Seal - CB891 - TR07870-002
CB12	Control Bldg, el.436', Cable Chase, Room 36-03	S	R	E	Penetration Seal - CB1082 - TR07870-002
CB15	Control Bldg, el.448', Room 48-02		R	E	Penetration Seal - CB891, CB1082 - TR07870-002
CB17.01	Control Bldg, el.463', Room 63-05 in MCB		R		
CB17.01	Control Bldg, el.463', Rooms 63-05, -13		R		
CB17.02	Control Bldg, el.463', Rooms 63-06, -07, -10, -11, -12			E	Penetration Seal - CB211 - TR07870-002
CB18	Control Bldg, el.463', Room 63-04		R		
CB20	Control Bldg, el.463', Room 63-03		R	E	Penetration Seal - CB423/AB423 - TR07870-002
CB22	Control Bldg, el.482', Rooms 82-02, -03			E	Penetration Seal - CB211- TR07870-002
CB23	Control Bldg, el.482', Rooms 82-01, -04			E	Penetration Seal - CB228- TR07870-002
Diesel Generator Building					
DG01.01	Diesel Generator Bldg, el.400', Room 00-01			E	Penetration Seal UMS DG0001 -TR07870-002
Fuel Handing Building					

Table 4-10 Summary of NFPA 805 Required Detection Systems

Fire Area / Fire Zone	Protected Area Description	Required			Comments / References
		NSCA	Performance-Based	Engineering Evaluation	
FH01	**Fire Area FH01**				
FH01.01	Fuel Handling Bldg, el.412', Room 12-01	S		E	Detection TR0780E-001; Penetration Seal UMS FH1201RBW/RB1201NNWN - TR07870-002
FH01.03	Fuel Handling Bldg, el.436', Rooms 36-01E, -01W	S		E	Detection TR0780E-001; Penetration Seal UMS RB3601NNWN/FH3601W - TR07870-002
FH01.03	Fuel Handling Bldg, el.443'-6", Room 443-01	S			Detection TR0780E-001
FH01.04	Fuel Handling Bldg, el.463', Rooms 63-01, -01N, -01S	S		E	Detection TR0780E-001; Penetration Seal UMS RB6301NNWW/FH6301SSRBW - TR07870-002
Intermediate Building					
IB07.01	Intermediate Bldg, el.412', Room 12-13C	S			Separation TR0780E-001
IB07.02	Intermediate Bldg, el.412', Room 12-13B	S			Separation TR0780E-001
IB07.03	Intermediate Bldg, el.412', Room 12-13A	S			Separation TR0780E-001
IB10	Intermediate Bldg, el.423', Room 23-02		R		
IB11	Intermediate Bldg, el.426', Room 26-01		R		
IB14	Intermediate Bldg, el.436', Room 36-03A		R	E	Penetration Seals - IB183 - TR07870-002
IB17	Intermediate Bldg, el.451', Room 51-02		R		
IB20	Intermediate Bldg, el.463', Room 63-01		R		
IB21.01	Intermediate Bldg, el.463', Room 63-02		R		
IB21.02	Intermediate Bldg, el.463', Room 63-03		R		
IB22.01	Intermediate Bldg, el.423', Room 23-01		R		

Table 4-10 Summary of NFPA 805 Required Detection Systems

Fire Area / Fire Zone	Protected Area Description	Required NSCA	Required Performance-Based	Required Engineering Evaluation	Comments / References
IB22.02	Intermediate Bldg, el.436', Room 36-01		R		
IB23.02	Intermediate Bldg, el.426', Room 26-02		R		
IB24	Intermediate Bldg, el.436', Room 36-03B		R		
IB25	**Fire Area Assessment**				
IB25.01.01	Intermediate Bldg, el.412', Room 12-02W (SWBP A)	S			Separation TR0780E-001
IB25.01.02	Intermediate Bldg, el.412', Room 12-02	S	R		Separation TR0780E-001
IB25.01.02	Intermediate Bldg, el.412', Room 12-02W	S	R		Separation TR0780E-001
IB25.01.03	Intermediate Bldg, el.412', Room 12-02	S	R		Separation TR0780E-001
IB25.01.03	Intermediate Bldg, el.412', Room 12-02E	S	R		Separation TR0780E-001
IB25.01.03	Intermediate Bldg, el.423', Room 236-01	S	R		Separation TR0780E-001
IB25.01.04	Intermediate Bldg, el.412', Room 12-02E	S			
IB25.01.05	Intermediate Bldg, el.412', Room 12-02	S	R		Separation TR0780E-001
IB25.03.01	Intermediate Bldg, el.412', East Penetration Area North, Room 12-01	S		E	Separation TR0780E-001; Penetration Seal - UMS PAI1201W/Rb1201EE - TR07870-002
IB25.03.02	Intermediate Bldg, el.412', East Penetration Area South, Room 12-01	S			Separation TR0780E-001
IB25.04	Intermediate Bldg, el.412', West Penetration Area South, Room 12-01			E	Penetration Seal - UMS PAI1201E/RB1201WW - TR07870-002
IB25.05.01	Intermediate Bldg, el.436', East Penetration Area North, Room 36-01			E	Penetration Seal - UMS RB3601NSS/PAI3601RBW - TR07870-002
IB25.06.01	Intermediate Bldg, el.436', Room 36-02	S			
IB25.06.02	Intermediate Bldg, el.436', Room 36-02	S	R	E	Penetration Seal - IB183, AB114/IB114 -

Table 4-10 Summary of NFPA 805 Required Detection Systems

Fire Area / Fire Zone	Protected Area Description	Required NSCA	Required Performance-Based	Required Engineering Evaluation	Comments / References
					TR07870-002
IB25.07	Intermediate Bldg, el.436', Room 36-02	S			Suppression "throughout the area" TR0780E-001
IB25.09	Intermediate Bldg, el.463', Room 63-03			E	Penetration Seal - UMS PAA3601E/RB3601WW - TR07870-002
IB27	Intermediate Bldg, el.412', Room 12-09	S			Separation TR0780E-003
Reactor Building					
RB01.01.01	Reactor Bldg, el.412', Rooms 12-01NNW, 12-01NW, 12-01W, and 12-01SW			E	Penetration Seals - UMS PAA1201E/RB1201WW - TR0787E-01
RB01.01.02	Reactor Bldg, el.412', Rooms 12-01S, 12-01SE, 12-01E, 12-NE, and 12-01NNE			E	Penetration Seals - UMS PAI1201W/RB1201EE - TR0787E-01
RB01.03.01	Reactor Bldg, el.436', Room 36-01NNW			E	Penetration Seals - UMS RB360WNWN/FH3601W - TR07870-002
RB01.03.02	Reactor Bldg, el.436', Rooms 36-01NNW, 36-01NW, 36-01W, and 36-01SW			E	Penetration Seals - UMS PAA3601E/RB3601WW - TR0787E-01
RB01.03.03	Reactor Bldg, el.436', Rooms 36-01SE, 36-01S, 36-01E, 36-01NE, 36-01NNE			E	Penetration Seals - UMS RB3601NSS/PAI3601RBW - TR0787E-01
RB01.04.01	Reactor Bldg, el.463', Rooms 63-01NNW, 63-01NNE			E	Penetration Seals - UMS RB6301WW/PAA6303E - TR0787E-01
Turbine Building					
TB02	Turbine Bldg, el.412', Room 12-01		R	E	Penetration Seals - TB27 - TR07870-002
TB-03	Turbine Bldg, el.436', Room 36-01		R		
Yard					
YD02.01	Condensate Storage Tank - South Side	S			Detection, TR0780E-001
YD02.02	Condensate Storage Tank - North Side	S			Detection, TR0780E-001

Table 4-10 Summary of NFPA 805 Required Detection Systems

Fire Area / Fire Zone	Protected Area Description	Required			Comments / References
		NSCA	Performance-Based	Engineering Evaluation	
Service Water Pump House					
SWPH01	Service Water Pumphouse, el.425', Room 25-05		R		
SWPH03	Service Water Pumphouse, el.441', Room 41-01			E	Penetration Seals - SW341 - TR07870-002
SWPH04.01	Service Water Pumphouse, el.441', Room 41-01A			E	Penetration Seals - SW341 - TR07870-002
SWPH05.01.01	Service Water Pumphouse, el.425', Room 25-03	S			Separation TR0780E-001
SWPH05.01.02	Service Water Pumphouse, el.425', Room 25-01	S			Separation TR0780E-001
SWPH05.01.03	Service Water Pumphouse, el.425', Room 25-02	S			Separation TR0780E-001
SWPH05.02.01	Service Water Pumphouse, el.436', Room 36-01	S			Separation TR0780E-001
SWPH05.02.02	Service Water Pumphouse, el.436', Room 36-01	S			Separation TR0780E-001
SWPH05.02.03	Service Water Pumphouse, el.436', Room 36-01	S			Separation TR0780E-001

4.8.3 Fire Risk Insights

Fire PRA Overall Risk Insights

Risk insights were documented as part of the development of the Fire PRA. The total plant fire CDF/LERF was derived using the NUREG/CR-6850 methodology for Fire PRA development and is useful in identifying the areas of the plant where fire risk is greatest. The risk insights generated were useful in identifying areas where specific contributors might be mitigated via modification. A detailed description of significant risk sequences associated with the fire initiating events that collectively represent 95% (and individually any sequences above 1% contribution) of the calculated fire risk for the plant was prepared for the purposes of gaining these insights and an understanding of the risk significance of MSO combinations. These insights are provided in Attachment W, Tables W-1 and W-2.

Risk Change Due to NFPA 805 Transition

In accordance with the guidance in Regulatory Position 2.2.4.2 of RG 1.205 Revision 1:

> *"The total increase or decrease in risk associated with the implementation of NFPA 805 for the overall plant should be calculated by summing the risk increases and decreases for each fire area (including any risk increases resulting from previously approved recovery actions). The total risk increase should be consistent with the acceptance guidelines in Regulatory Guide 1.174. Note that the acceptance guidelines of Regulatory Guide 1.174 may require the total CDF, LERF, or both, to evaluate changes where the risk impact exceeds specific guidelines. If the additional risk associated with previously approved recovery actions is greater than the acceptance guidelines in Regulatory Guide 1.174, then the net change in total plant risk incurred by any proposed alternatives to the deterministic criteria in NFPA 805, Chapter 4 (other than the previously approved recovery actions), should be risk-neutral or represent a risk decrease."*

Delta risk calculations are performed on the fire areas that have recovery actions, or for which the Nuclear Safety Capability Assessment (NSCA) identifies variances from deterministic requirements (VFDRs) to be addressed with a fire risk evaluation (FRE). The corresponding fire areas are as follows: AB01, CB01, CB02, CB03, CB04, CB05, CB06, CB15, CB17, CB18, CB20, CB22, CB23, IB05, IB10, IB12, IB13, IB14, IB15, IB17, IB20, IB21, IB22, IB25, IB27, RB01, SWPH03, SWPH04, SWPH05, TB01, TB02, and YD01.

The total delta risks (fire-induced and from internal events) are found to be, with an acceptable safety margin, within the acceptable limits of Regulatory Guide 1.174, namely in Region III of Figure 3 and Figure 4 of that guide (i.e., delta CDF less than 1E-06/yr and delta LERF less than 1E-07/yr). In addition, a qualitative analysis of DID supported by Fire PRA insights finds an adequate balance between the DID echelons, which do not require further improvements.

The fire-induced CDF and LERF at the plant level are approximately equal to 5.7E-05/yr and 2.7E-07/yr, respectively. In addition, the internal-event (including internal flood) contributions to the CDF and LERF at the plant level are approximately 3.6E-06/yr and 1.3E-07/yr, respectively. This results in a total baseline CDF and LERF approximately

equal to 6E-05/yr and 4E-07/yr. These numbers credit the planned plant modifications (References: PRA Evaluations 11-4 and 11-13).

At the plant level, the cumulative delta CDF and delta LERF, accounting for both VFDRs and recovery actions, are approximately equal to 4.6E-06/yr and 8.0E-09/yr, respectively. These cumulative delta risks can further be broken down into their contributions from VFDRs and recovery actions. Namely, the cumulative delta CDF (delta LERF) from the VFDRs is approximately equal to 3.6E-06/yr (5.3E-09/yr), and the cumulative delta CDF (delta LERF) from the recovery actions is approximately equal to 9.6E-07/yr (2.7E-09/yr). These delta risks are based solely on the scope of the fire initiating events. In addition, the delta CDF and delta LERF from internal events (including internal flood) between the post-transition and the pre-transition plant are equal to -8.8E-06/yr and -3.1E-09/yr, respectively (the decrease in risk is due to the modifications between the pre- and post-transition plants). This sums to a global delta CDF and delta LERF respectively equal to: -4.2E-06/yr and 4.9E-09/yr (Reference: PRA Evaluation 11-4).

The cumulative delta risk values are in compliance with the numerical performance criteria of Regulatory Guide 1.174.

4.8.4 Plant Modifications and Items to be Completed During the Implementation Phase

Planned hardware modifications to comply with NFPA 805 are described in Attachment S, Table S-1.

The VCS Fire PRA or Engineering teams did not identify any planned plant changes that would significantly impact the PRA model (see Section 4.0 of the Transition Report), beyond those identified and scheduled to be implemented as part of the transition to the 10 CFR 50.48(c) FPP, as set forth in the license condition.

The Fire PRA model represents the as-built, as-operated and maintained plant, including known proposed plant changes identified through ADD DATE, as it will be configured at the completion of the transition to NFPA 805. The Fire PRA model includes credit for the planned implementation of new improved RCP seal packages and an alternate seal injection (ASI) system, as well as modifications to existing operating procedures. Following installation of new RCP seal packages and ASI, and the attendant installation details, additional refinements related to the new reactor coolant pump (RCP) seal packages and ASI modifications may need to be incorporated into the FPRA model. The same is true of the new procedures once they are finalized. However, these changes are not expected to be significant and will likely result in additional risk improvement. No other significant plant changes are outstanding with respect to their inclusion in the Fire PRA model. Additional modifications discussed in Attachment S, Table S-1, are also included in the FPRA model and their effect on the fire risk quantification results is included. If significant plant changes are implemented but were not previously incorporated into the Fire PRA model, they will be screened, dispositioned and scheduled for incorporation into the model per Section 4.7.3 of the Transition Report.

4.9 Supplemental Information – Other VCSNS Specific Issues

4.9.1 Self-Induced Station Blackout (SISBO)

The previous Appendix R methodology involves intentionally de-energizing both offsite power and one on-site emergency power sources to prevent spurious operation of equipment. The SISBO methodology will be eliminated during the NFPA 805 transition process.

Background

Section III.G of Appendix R to 10 CFR 50 stipulates the requirements to ensure the ability to achieve and maintain safe shutdown conditions. At least one train of equipment and systems required to achieve and maintain hot shutdown conditions is required to be "free of fire damage" from either the control room or emergency control station. The Appendix R compliance assessment methodology at VCSNS credited operator manual actions to intentionally de-energize power to vital power supplies buses to prevent and/or limit the number of spurious operations that could occur as a result of an Appendix R fire, and local operator manual actions were credited to position or verify position of motor and pneumatic operated valves. These operator actions ideally initiated a SISBO condition. The SISBO methodology is considered to be a significant contributor to Core Damage Frequency because it involves operator actions to de-energize both offsite power sources and on-site emergency power sources.

Resolution

Because the premise of the current Appendix R analysis relied heavily on operator manual actions in lieu of identifying safe shutdown cables, performing the detailed circuit analysis and identifying the location of the safe shutdown cables, the SISBO elimination strategy involves determining the extent of fire damage of safe shutdown cables in each fire area. This effort involves performing the detailed cable identification, circuit analysis, and locating cables that are required for the safe shutdown equipment to perform the desired function to bring the VCSNS plant from full power safe and stable conditions (Section 4.2.1.2 of the Transition Report) to cold shutdown conditions.

After identification of nuclear safety systems and equipment, circuit analysis, cable location and instrument tube location, the NSCA fire area by area assessment identified deterministic approaches for Nuclear Safety Performance Criteria compliance. Where deterministic compliance could not be achieved, station modifications were proposed or a performance-based approach was used, documented in Fire Modeling or Fire Risk Evaluations. The Fire Risk Evaluation evaluated the risk associated with the variant alternative against the fire risk associated with the deterministically compliant alternative. The delta risk between these two was compared to the risk acceptance criteria for resolution.

Since NEI 04-02 was written primarily to transition existing fire protection programs, and existing shutdown strategies, SCE&G initiated FAQ 09-0057 to address a direct approach to analysis and compliance directly in alignment with NFPA 805.

4.9.2 NFPA 805 Chapter 4 Requirements for Approval

The following sections of NFPA 805 Chapter 4 below may not have previous NRC approval of an alternate approach, methods and/or condition which VCSNS considers to be minor variations to the NFPA 805 requirements.

4.2.3.3 (b) – Approval is requested for locations in the plant where twenty feet of separation is required, but intervening combustibles exist. The intervening combustibles are in the form of exposed cable trays.

The specific deviation is provided in Attachment X. VCSNS requests NRC approval of this proposed alternative and clarification of the FPP elements.

5.0 REGULATORY EVALUATION

5.1 Introduction – 10 CFR 50.48

On July 16, 2004 the NRC amended 10 CFR 50.48, Fire Protection, to add a new subsection, 10 CFR 50.48(c), which establishes alternative fire protection requirements. 10 CFR 50.48 endorses, with exceptions, NFPA 805, Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants – 2001 Edition, as a voluntary alternative for demonstrating compliance with 10 CFR 50.48 Section (b), Appendix R, and Section (f), Decommissioning.

The voluntary adoption of 10 CFR 50.48(c) by VCSNS does not eliminate the need to comply with 10 CFR 50.48(a) and 10 CFR 50, Appendix A, GDC 3, Fire Protection. The NRC addressed the overall adequacy of the regulations during the promulgation of 10 CFR 50.48(c) (Reference FR Notice 69 FR 33536 dated June 16, 2004, ML041340086).

> *"NFPA 805 does not supersede the requirements of GDC 3, 10 CFR 50.48(a), or 10 CFR 50.48(f). Those regulatory requirements continue to apply to licensees that adopt NFPA 805. However, under NFPA 805, the means by which GDC 3 or 10 CFR 50.48(a) requirements may be met is different than under 10 CFR 50.48(b). Specifically, whereas GDC 3 refers to SSCs important to safety, NFPA 805 identifies fire protection systems and features required to meet the Chapter 1 performance criteria through the methodology in Chapter 4 of NFPA 805. Also, under NFPA 805, the 10 CFR 50.48(a)(2)(iii) requirement to limit fire damage to SSCs important to safety so that the capability to safely shut down the plant is ensured is satisfied by meeting the performance criteria in Section 1.5.1 of NFPA 805. The Section 1.5.1 criteria include provisions for ensuring that reactivity control, inventory and pressure control, decay heat removal, vital auxiliaries, and process monitoring are achieved and maintained.*
>
> *This methodology specifies a process to identify the fire protection systems and features required to achieve the nuclear safety performance criteria in Section 1.5 of NFPA 805. Once a determination has been made that a fire protection system or feature is required to achieve the performance criteria of Section 1.5, its design must meet any applicable requirements of NFPA 805, Chapter 3. Having identified the required fire protection systems and features, the licensee selects either a deterministic or performance-based approach to demonstrate that the performance criteria are satisfied. This process satisfies the GDC 3 requirement to design and locate SSCs important to safety to minimize the probability and effects of fires and explosions." (Reference FR Notice 69 FR 33536 dated June 16, 2004, ML041340086)*

The new rule provides actions that may be taken to establish compliance with 10 CFR 50.48(a), which requires each operating nuclear power plant to have a fire protection program plan that satisfies GDC 3, as well as specific requirements in that section. The transition process described in 10 CFR 50.48(c)(3)(ii) provides, in pertinent parts, that a licensee intending to adopt the new rule must, among other things, "modify the fire protection plan required by paragraph (a) of that section to reflect the licensee's decision to comply with NFPA 805." Therefore, to the extent that the

contents of the existing fire protection program plan required by 10 CFR 50.48(a) are inconsistent with NFPA 805, the fire protection program plan must be modified to achieve compliance with the requirements in NFPA 805. All other requirements of 10 CFR 50.48 (a) and GDC 3 have corresponding requirements in NFPA 805.

A comparison of the current requirements in Appendix R with the comparable requirements in Section 3 of NFPA 805 shows that the two sets of requirements are consistent in many respects. This was further clarified in FAQ 07-0032, 10 CFR 50.48(a) and GDC 3 clarification (ML081400292). The following tables provide a cross reference of fire protection regulations associated with the post-transition VCSNS fire protection program and applicable industry and VCSNS documents that address the topic.

10 CFR 50.48(a)

Table 5-1 10 CFR 50.48(a) – Applicability/Compliance Reference

	10 CFR 50.48(a) Section(s)	Applicability/Compliance Reference
(1)	Each holder of an operating license issued under this part or a combined license issued under part 52 of this chapter must have a fire protection plan that satisfies Criterion 3 of appendix A to this part. This fire protection plan must:	See below
	(i) Describe the overall fire protection program for the facility;	NFPA 805 Section 3.2 NEI 04-02 Table B-1
	(ii) Identify the various positions within the licensee's organization that are responsible for the program;	NFPA 805 Section 3.2.2 NEI 04-02 Table B-1
	(iii) State the authorities that are delegated to each of these positions to implement those responsibilities; and	NFPA 805 Section 3.2.2 NEI 04-02 Table B-1
	(iv) Outline the plans for fire protection, fire detection and suppression capability, and limitation of fire damage.	NFPA 805 Section 2.7 and Chapters 3 and 4 NEI 04-02 B-1 and B-3 Tables
(2)	The plan must also describe specific features necessary to implement the program described in paragraph (a)(1) of this section such as:	See below
	(i) Administrative controls and personnel requirements for fire prevention and manual fire suppression activities;	NFPA 805 Sections 3.3.1 and 3.4 NEI 04-02 Table B-1
	(ii) Automatic and manually operated fire detection and suppression systems; and	NFPA 805 Sections 3.5 through 3.10 and Chapter 4 NEI 04-02 B-1 and B-3 Tables
	(iii) The means to limit fire damage to structures, systems, or components important to safety so that the capability to shut down the plant safely is ensured.	NFPA 805 Section 3.3 and Chapter 4 NEI 04-02 B-3 Table
(3)	The licensee shall retain the fire protection plan and each change to the plan as a record until the Commission terminates the reactor license. The licensee shall retain each superseded revision of the procedures for 3 years from the date it was superseded.	NFPA 805 Section 2.7.1.1 requires that documentation (Analyses, as defined by NFPA 805 2.4, performed to demonstrate compliance with this standard) be maintained for the life of the plant. See Attachment A.

Table 5-1 10 CFR 50.48(a) – Applicability/Compliance Reference

10 CFR 50.48(a) Section(s)	Applicability/Compliance Reference
(4) Each applicant for a design approval, design certification, or manufacturing license under part 52 of this chapter must have a description and analysis of the fire protection design features for the standard plant necessary to demonstrate compliance with Criterion 3 of appendix A to this part.	Not applicable VCSNS is licensed under 10 CFR 50.

General Design Criterion 3

Table 5-2 GDC 3 – Applicability/Compliance Reference

GDC 3, Fire Protection, Statement	Applicability/Compliance Reference
Structures, systems, and components important to safety shall be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions.	NFPA 805 Chapters 3 and 4 NEI 04-02 B-1 and B-3 Tables
Noncombustible and heat resistant materials shall be used wherever practical throughout the unit, particularly in locations such as the containment and control room.	NFPA 805 Sections 3.3.2, 3.3.3, 3.3.4, 3.11.4 NEI 04-02 B-1 Table
Fire detection and fighting systems of appropriate capacity and capability shall be provided and designed to minimize the adverse effects of fires on structures, systems, and components important to safety.	NFPA 805 Chapters 3 and 4 NEI 04-02 B-1 and B-3 Tables
Firefighting systems shall be designed to assure that their rupture or inadvertent operation does not significantly impair the safety capability of these structures, systems, and components	NFPA 805 Sections 3.4 through 3.10 and 4.2.1 NEI 04-02 Table B-3

10 CFR 50.48(c)

Table 5-3 10 CFR 50.48(c) – Applicability/Compliance Reference

10 CFR 50.48(c) Section(s)	Applicability/Compliance Reference
(1) *Approval of incorporation by reference.* National Fire Protection Association (NFPA) Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants, 2001 Edition" (NFPA 805), which is referenced in this section, was approved for incorporation by reference by the Director of the Federal Register pursuant to 5 U.S.C. 552(a) and 1 CFR part 51.	General Information. NFPA 805 (2001 edition) is the edition used.
(2) Exceptions, modifications, and supplementation of NFPA 805. As used in this section, references to NFPA 805 are to the 2001 Edition, with the following exceptions, modifications, and supplementation:	General Information. NFPA 805 (2001 edition) is the edition used.
(i) *Life Safety Goal, Objectives, and Criteria.* The Life Safety Goal, Objectives, and Criteria of Chapter 1 are not endorsed.	The Life Safety Goal, Objectives, and Criteria of Chapter 1 of NFPA 805 are not part of the LAR.
(ii) *Plant Damage/Business Interruption Goal, Objectives, and Criteria.* The Plant Damage/Business Interruption Goal, Objectives, and Criteria of Chapter 1 are not endorsed.	The Plant Damage/Business Interruption Goal, Objectives, and Criteria of Chapter 1 of NFPA 805 are not part of the LAR.
(iii) *Use of feed-and-bleed.* In demonstrating compliance with the performance criteria of Sections 1.5.1(b) and (c), a high-pressure charging/injection pump coupled with the pressurizer power-operated relief valves (PORVs) as the sole fire-protected safe shutdown path for maintaining reactor coolant inventory, pressure control, and decay heat removal capability (i.e., feed-and-bleed) for pressurized-water reactors (PWRs) is not permitted.	Feed and bleed is not utilized as the sole fire-protected safe shutdown methodology.
(iv) Uncertainty analysis. An uncertainty analysis performed in accordance with Section 2.7.3.5 is not required to support deterministic approach calculations.	Uncertainty analysis was not performed for deterministic methodology.
(v) Existing cables. In lieu of installing cables meeting flame propagation tests as required by Section 3.3.5.3, a flame-retardant coating may be applied to the electric cables, or an automatic fixed fire suppression system may be installed to provide an equivalent level of protection. In addition, the italicized exception to Section 3.3.5.3 is not endorsed.	Electrical cable construction complies with a flame propagation test that was found acceptable to the NRC as documented in NEI 04-02 Table B-1.
(vi) Water supply and distribution. The italicized exception to Section 3.6.4 is not endorsed. Licensees who wish to use the exception to Section 3.6.4 must submit a request for a license amendment in accordance with paragraph (c)(2)(vii) of this section.	See Section 4.1.2.2.

Table 5-3 10 CFR 50.48(c) – Applicability/Compliance Reference

	10 CFR 50.48(c) Section(s)	Applicability/Compliance Reference
	(vii) Performance-based methods. Notwithstanding the prohibition in Section 3.1 against the use of performance-based methods, the fire protection program elements and minimum design requirements of Chapter 3 may be subject to the performance-based methods permitted elsewhere in the standard. Licensees who wish to use performance-based methods for these fire protection program elements and minimum design requirements shall submit a request in the form of an application for license amendment under § 50.90. The Director of the Office of Nuclear Reactor Regulation, or a designee of the Director, may approve the application if the Director or designee determines that the performance-based approach; (A) Satisfies the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release; (B) Maintains safety margins; and (C) Maintains fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).	The use of performance-based methods for NFPA 805 Chapter 3 is requested. See Attachment L.
(3)	*Compliance with NFPA 805.*	See below
	(i) A licensee may maintain a fire protection program that complies with NFPA 805 as an alternative to complying with paragraph (b) of this section for plants licensed to operate before January 1, 1979, or the fire protection license conditions for plants licensed to operate after January 1, 1979. The licensee shall submit a request to comply with NFPA 805 in the form of an application for license amendment under § 50.90. The application must identify any orders and license conditions that must be revised or superseded, and contain any necessary revisions to the plant's technical specifications and the bases thereof. The Director of the Office of Nuclear Reactor Regulation, or a designee of the Director, may approve the application if the Director or designee determines that the licensee has identified orders, license conditions, and the technical specifications that must be revised or superseded, and that any necessary revisions are adequate. Any approval by the Director or the designee must be in the form of a license amendment approving the use of NFPA 805 together with any necessary revisions to the technical specifications.	The LAR was submitted in accordance with 10 CFR 50.90. The LAR included applicable license conditions, orders, technical specifications/bases that needed to be revised and/or superseded.
	(ii) The licensee shall complete its implementation of the methodology in Chapter 2 of NFPA 805 (including all required evaluations and analyses) and, upon completion, modify the fire protection plan required by paragraph (a) of this section to reflect the licensee's decision to comply with NFPA 805, before changing its fire protection program or nuclear power plant as permitted by NFPA 805.	The LAR and transition report summarize the evaluations and analyses performed in accordance with Chapter 2 of NFPA 805.
(4)	Risk-informed or performance-based alternatives to compliance with NFPA 805. A licensee may submit a request to use risk-informed or performance-based alternatives to compliance with NFPA 805. The request must be in the form of an application for license amendment under § 50.90 of this chapter. The Director of the Office of Nuclear Reactor Regulation, or designee of the Director, may approve the application if the Director or designee determines that the proposed alternatives: (i) Satisfy the performance goals, performance objectives, and performance criteria specified in NFPA 805 related to nuclear safety and radiological release; (ii) Maintain safety margins; and (iii) Maintain fire protection defense-in-depth (fire prevention, fire detection, fire suppression, mitigation, and post-fire safe shutdown capability).	No risk-informed or performance-based alternatives to compliance with NFPA 805 (per 10 CFR 50.48(c)(4)) were utilized. See Attachment P.

5.2 Regulatory Topics

5.2.1 License Condition Changes

The current VCSNS fire protection license condition 2.c (18) is being replaced with the standard license condition based upon Regulatory Position 3.1 of RG 1.205, as shown in Attachment M.

5.2.2 Technical Specifications

VCSNS conducted a review of the Technical Specifications to determine which Technical Specifications are required to be revised, deleted, or superseded. VCSNS determined that the changes to the Technical Specifications and applicable justification listed in Attachment N are adequate for the VCSNS adoption of the new fire protection licensing basis.

5.2.3 Orders and Exemptions

A review was conducted of the VCSNS docketed correspondence to determine if there were any orders or exemptions that needed to be superseded or revised. A review was also performed to ensure that compliance with the physical protection requirements, security orders, and adherence to those commitments applicable to the plant are maintained. A discussion of affected orders and exemptions is included in Attachment O.

5.3 Regulatory Evaluations

5.3.1 No Significant Hazards Consideration

A written evaluation of the significant hazards consideration of a proposed license amendment is required by 10 CFR 50.92. According to 10 CFR 50.92, a proposed amendment to an operating license involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not:

- Involve a significant increase in the probability or consequences of an accident previously evaluated; or
- Create the possibility of a new or different kind of accident from any accident previously evaluated; or
- Involve a significant reduction in a margin of safety.

This evaluation is contained in Attachment Q.

Based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public. VCSNS has evaluated the proposed amendment and determined that it involves no significant hazards consideration.

5.3.2 Environmental Consideration

Pursuant to 10 CFR 51.22(b), an evaluation of the LAR has been performed to determine whether it meets the criteria for categorical exclusion set forth in 10 CFR

51.22(c). That evaluation is discussed in Attachment R. The evaluation confirms that this LAR meets the criteria set forth in 10 CFR 51.22(c)(9) for categorical exclusion from the need for an environmental impact assessment or statement.

5.4 Transition Implementation Schedule

The following schedule for transitioning VCSNS to the new fire protection licensing basis requires NRC approval of the LAR in accordance with the following schedule:

- Implementation of new NFPA 805 fire protection program to include procedure changes, process updates, and training to affected plant personnel. This will occur one hundred eighty (180) days after NRC approval.
- Modifications scope and implementation schedule are provided in Attachment S. Appropriate compensatory measures will be maintained until modifications are complete.

6.0 REFERENCES

The following references were used in the development of the TR. Additional references are in the NEI 04-02 Tables in the various Attachments.

1. ANSI/ANS-58.23-2007, "American National Standard - Fire PRA Methodology," November 20, 2007.
2. ASME/ANS RA-Sa–2009, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications," February 2, 2009.
3. Federal Register Notice 69 FR 33536, dated June 16, 2004 (ML041340086).
4. Fire Protection Program—Post-Fire Operator Manual Actions, Federal Register, Vol. 71, No. 43, March 6, 2006, pp. 11169-11172.
5. Jones, Walter W., Richard D. Peacock, Glenn P. Forney, Paul A. Reneke, CFAST – Consolidated Model of Fire Growth and Smoke Transport (Version 6), Technical Reference Guide, Special Publication 1026, National Institute of Standards and Technology, Gaithersburg, MD, April 2009.
6. Letter, Annette L. Vietti-Cook, Secretary to R. W. Borchardt, Executive Director for Operations, "Staff Requirements – SECY-11-0033 – Proposed NRC Staff Approach to Address Resource Challenges Associated with Review of a Large Number of NFPA 805 License Amendment Requests," April 20, 2011 (ML111101452).
7. Letter, Annette L. Vietti-Cook, Secretary to R. W. Borchardt, Executive Director for Operations, "Staff Requirements – SECY-11-0061 – A Request to Revise the Interim Enforcement Policy for Fire Protection Issues on 10 CFR 50.48(C) to Allow Licensees to Submit License Amendment Requests in a Staggered Approach (RIN 3150-AG48)," June 10, 2011 (ML1116106160).
8. Letter, NRC to NEI, "Process for Frequently Asked Questions For Title 10 of The Code Of Federal Regulations, Part 50.48(c) Transitions," July 12, 2006 (ML061660105).
9. Letter, NRC to SCE&G, "Deviation from 10 CFR Part 50, Appendix R, Section III.G. Fire Protection of Safe Shutdown Capability for Virgil C. Summer Nuclear Station," October 17, 1997 (TAC No. M97337).
10. Letter, NRC to SCE&G, "NRC Response To Progress Energy's Letter Of Intent To Adopt 10 CFR 50.48(c) (NFPA 805 Rule)," January 19, 2007 (ML063520409).
11. Letter, NRC to SCE&G, "Evaluation of the Request for an Extension of Enforcement Discretion in Accordance with the Interim Enforcement Policy for Fire Protection Issues During Transition to National Fire Protection Standard NFPA 805," October 19, 2009 (ML092920297).
12. Letter, SCE&G to NRC, "Letter Of Intent to Adopt NFPA 805, Performance-Based Standard For Fire Protection For Light Water Reactor Electric Generating Plants, 2001 Edition," October 19, 2006 (ML062990543).
13. Letter, SCE&G to NRC, "Request for Extension of Enforcement Discretion and Revised Submittal Schedule for 10 CFR 50.48(c) License Amendment Request (LAR 08-03929)," July 16, 2009.

14. NEI 00-01, "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Revision 1, January 2005.
15. NEI 00-01, "Guidance for Post-Fire Safe Shutdown Circuit Analysis," Revision 2, May 2009.
16. NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program under 10 CFR 50.48(c)," Revision 2, April 2008.
17. NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition.
18. NRC Enforcement Policy, Policy Statement: Revision, Federal Register, Vol. 69, No. 115, June 16, 2004, pp. 33684–33685.
19. NRC Enforcement Policy: Extension of Discretion Period of Interim Enforcement Policy, Federal Register, Vol. 71, No. 74, April 18, 2006, pp. 19905-19907.
20. NRC Enforcement Policy: Extension of Enforcement Discretion of Interim Policy, Policy Statement: Revision, Federal Register, Vol. 70, No. 10, January 14, 2005, pp. 2662–2664.
21. NUMARC 91-06, "Guidelines for Industry Actions to Assess Shutdown Management."
22. NUMARC 93-01, "Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Revision 3, July 2000.
23. NUREG-1805, Fire Dynamics Tools (FDTs). U.S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Washington, DC: 2004.
24. NUREG/CR-6850, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," April 2005.
25. Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Revision 1, November 2002.
26. Regulatory Guide 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 2, March 2009.
27. Regulatory Guide 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," Revision 1, December 2009.
28. Regulatory Information Summary 2006-10, "Regulatory Expectations with Appendix R Paragraph III.G.2 Operator Manual Actions," June 30, 2006.
29. Regulatory Information Summary 2007-19, "Process For Communicating Clarifications Of Staff Positions Provided In Regulatory Guide 1.205 Concerning Issues Identified During The Pilot Application of NFPA 805," August 20, 2007.
30. Safety Evaluation Report related to the operation of Virgil C. Summer Nuclear Station, Unit. No. 1, Docket No. 50-395, February, 1981.
31. Safety Evaluation Report related to the operation of Virgil C. Summer Nuclear Station, Unit. No. 1, Docket No. 50-395, Supplement No. 2, May, 1981.
32. Safety Evaluation Report related to the operation of Virgil C. Summer Nuclear Station, Unit. No. 1, Docket No. 50-395, Supplement No. 3, January, 1982.

33. Safety Evaluation Report related to the operation of Virgil C. Summer Nuclear Station, Unit. No. 1, Docket No. 50-395, Supplement No. 4, August, 1982.
34. SECY-03-0100, "Rulemaking Plan on Post-Fire Operator Manual Actions," June 17, 2003.
35. SECY-06-0010, "Withdraw Proposed Rulemaking - Fire Protection Program Post-Fire Operator Manual Actions," January 12, 2006.
36. SECY-11-0033, "Proposed NRC Staff Approach to Address Resource Challenges Associated with Review of a Large Number of NFPA 805 License Amendment Requests," March 4, 2011.
37. SECY-11-0061, "A Request to Revise the Interim Enforcement Policy for Fire Protection Issues on 10 CFR 50.48(C) to Allow Licensees to Submit License Amendment Requests in a Staggered Approach (RIN 3150-AG48)," April 29, 2011.
38. Voluntary Fire Protection Requirement for Light-Water Reactors; Adoption of NFPA 805 as a Risk-Informed, Performance-Based Alternative, Final Rule, Federal Register, Vol. 69, No. 115, June 16, 2004, pp. 33536–33551.
39. Voluntary Fire Protection Requirements for Light-Water Reactors; Adoption of NFPA 805 as a Risk-Informed, Performance-Based Alternative, Proposed Rule, Federal Register, Vol. 67, No. 212, November 1, 2002, pp. 66578–66588.

ATTACHMENTS

A. NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements

45 Pages Attached

Transition of Fundamental Fire Protection Program and Design Elements

Each section and subsection of NFPA 805 Chapter 3 was reviewed against the current station fire protection program. Upon completion of the activities associated with the review, one or more of the following compliance statement(s) were used:

- **Complies (C) –** The existing FPP elements are determined to meet the requirements of NFPA 805 Chapter 3 element. Acknowledgement and/or restatement of the requirement are not required. An open item in this category means there are action items to be completed during implementation prior to transition. Complies directly with the requirements of NFPA 805 Chapter 3.
- **Complies by Alternative (CA) –** The existing FPP elements meet the requirements of NFPA 805 by using clarification and/or equivalent alternative(s). VCSNS requests NRC review/approval of those CA items listed in Section 4.1.2.3 (Table 4-1) of the Transition Report and included in Attachment L. Complies with clarification with the requirements of NFPA 805 Chapter 3.
- **Complies with Fire Protection Engineering Equivalency Evaluations (CE) –** The existing FPP elements have been determined to be adequate for the hazard by a FPE and to meet the NFPA 805 Chapter 3 requirements. Complies through the use of Fire Protection Engineering Equivalency Evaluations (FPEEE) which are valid and of appropriate quality. VCSNS requests NRC review/approval of those Engineering Evaluations listed in Section 4.1.2.3 (Table 4-1) of the Transition Report and included in Attachment L.
- **Complies by Previous NRC Approval (CNRC) –** The existing FPP elements specified in NFPA 805 Chapter 3 requirements are not in strict compliance, however, previous NRC approval of the configuration exists. An NRC approved alternative or deviation to NFPA 805 Chapter 3, would supplant the specific requirement of NFPA 805 Chapter 3. Where credited, these prior approvals have been incorporated into an FPEEE, and included in Attachment K and Attachment L.
- **No Review Required (NRR) –** The existing Chapter 3 elements are not based on the requirements and/or are not applicable to elements of the VCSNS Fire Protection Program.

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
3.1	**General**			
	This chapter contains the fundamental elements of the fire protection program and specifies the minimum design requirements for the fire protection systems and features. These fire protection program elements and minimum design requirements shall not be subject to the performance-based methods permitted elsewhere in this standard. Previously approved alternatives from the fundamental protection program attributes of this chapter by the AHJ take precedence over the requirements contained herein.	NRR		Section heading with no requirements requiring evaluation. See subsections for requirements.
3.2	**Fire Protection Plan**			
3.2.1	**Intent.** A site-wide fire protection plan shall be established. This plan shall document management policy and program direction and shall define the responsibilities of those individuals responsible for the plan's implementation. This section establishes the criteria for an integrated combination of components, procedures, personnel to implement all fire protection activities.	C	SAP-0131, "Fire Protection Program", Rev 6D	The Station Administrative Procedure, SAP-131 defines and describes the Fire Protection Program (FPP) including responsibilities, program elements, and procedures to ensure effective implementation. The regulatory basis for this FPP is 10 CFR 50.48 Criterion 3 of Appendix A to this part, including Appendix R and NFPA 805-2001. (Table S-2, Item 1)
3.2.2	**Management Policy Direction and Responsibility**			
	A policy document shall be prepared that defines management authority and responsibilities and establishes the general policy for the site fire protection program.	C	SAP-0131, "Fire Protection Program", Rev 6D,	The Station Administrative Procedure (SAP) is consistent with other upper tier policy positions/ program documents at VCSNS. It provides a level of authority and responsibility for all groups and organizations for interfaces with the Fire Protection Program (FPP).

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements

Section	Section Description	Disposition	Reference Document	Results Summary
3.2.2.1	The policy document shall designate the senior management position with immediate authority and responsibility for the fire protection program.	C	SAP-0131, "Fire Protection Program", Rev 6D, Section 5.1	The Station Administrative Procedure (SAP) defines the General Manager, Nuclear Plant Operation as the management position with ultimate responsibility for the FP Program.
3.2.2.2	The policy document shall designate a position responsible for the daily administration and coordination of the fire protection program and its implementation.	C	SAP-0131, "Fire Protection Program", Rev 6D, Section 5.2	The Station Administrative Procedure (SAP) defines the Fire Protection Coordinator as the position responsible for the daily administration of the Fire Protection Program. (Table S-2, Item 1)
3.2.2.3	The policy document shall define the fire protection interfaces with other organizations and assign responsibilities for the coordination of activities. In addition, this policy document shall identify the various plant positions having the authority for implementing the various areas of the fire protection program.	C	SAP-0131, "Fire Protection Program", Rev 6D, Section 6.2	The Station Administrative Procedure (SAP) defines the interfaces, responsibilities and authorities for the various elements of the FP program. (Table S-2, Item 1)
3.2.2.4	The policy document shall identify the appropriate AHJ for the various areas of the fire protection program.	C	SAP-0131, "Fire Protection Program", Rev 6D	The Station Administrative Procedure (SAP) defines the AHJ for the various areas of the FP program. (Table S-2, Item 1)
3.2.3	**Procedures**			
	Procedures shall be established for implementation of the fire protection program. In addition to procedures that could be required by other sections of the standard, the procedures to accomplish the following shall be established:	C	SAP-0131, "Fire Protection Program", Rev 6D, Section 6.2	SAP-131 is the primary document that establishes the elements for implementing the fire protection program, including references to the applicable FPP implementing procedures.

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements

Section	Section Description	Disposition	Reference Document	Results Summary
	(1) Inspection, testing, and maintenance for the protection systems and features credited by the fire protection program	CA	SAP-0131, "Fire Protection Program", Rev 6D, Section 6.2.4, 6.2.5, 6.2.6 FPP-023, "Fire Detection", Rev 3A Enclosure 6.1 FPP-024, "Fire Suppression" , Rev 3C Enclosure 6.1 FPP-025, "Fire Containment", Rev 4F Enclosure 6.5, 6.6 EPRI Technical Report (TR) 1006756 Fire Protection Surveillance Optimization and Maintenance Guide NEIL Appendix 4.2.8	Inspection, Testing and Maintenance for the Fire Protection Program are established in accordance with controlled procedures. As practical, performance-based surveillance frequencies may be established as referenced herein and described in Electric Power Research Institute (EPRI) technical report and NEIL Appendix 4.2.8. (Table S-2, Item 2)
	(2) Compensatory actions implemented when fire protection systems and other systems credited by the fire protection program and this standard cannot perform their intended function and limits on impairment duration	C	FPP-023, "Fire Detection", Rev 3A Enclosure 6.1 FPP-024, "Fire Suppression" , Rev 3C Enclosure 6.1 FPP-025, "Fire Containment", Rev 4F Enclosure 6.5, 6.6	Existing procedures address current compensatory measures for the program, however a new procedure establishing revised and updated compensatory measures will be developed during the implementation period to incorporate NFPA 805 insights. (Table S-2, Item 1)
	(3) Reviews of fire protection program-related performance and trends	C	SAP-0131, "Fire Protection Program", Rev 6D ES0911, "Fire Protection Monitoring Program" Rev 0	Station Administrative Procedure (SAP) establishes responsibilities for review of program related performance and trends. System Engineering procedures establishes FP feature trends and monitoring. (Table S-2, Item 1) (Table S-2, Item 4)
	(4) Reviews of physical plant modifications and procedure changes for impact on the fire protection program	C	SAP-0133, "Design Control Program", Rev 14B SAP-0139, "Document Review and Approval Process", Rev 32 ES-427 "Program / Issues Screening" Rev 2D	Engineering Services and Document Control Procedures manage interfaces and direct appropriate documents to appropriate personnel for FP program impacts. (Table S-2, Item 3)

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
	(5) Long-term maintenance and configuration of the fire protection program	C	MD-21 "Configuration Management", Rev 7 SAP-131 "Fire Protection Program", Rev 6D SAP-0139 "Document Review and Approval Process", Rev 32 SAP-0133, "Design Control Program", Rev 14B	Long term maintenance and configuration of the fire protection program is implemented through a Management Directive (MD) and Station Administrative Procedures (SAP).
	(6) Emergency response procedures for the plant industrial fire brigade	C	EPP-013 "Fire Emergency", Rev 8	Station Emergency Response Procedures direct plant actions for plant fire brigade response due to fires at the station.
3.3	**Prevention**			
	A fire prevention program with the goal of preventing a fire from starting shall be established, documented, and implemented as part of the fire protection program. The two basic components of the fire prevention program shall consist of both of the following:	NRR	FPP022 "Fire Prevention", Rev 3	Elements of the fire prevention program are described in the following subsections.
	(1) Prevention of fires and fire spread by controls on operational activities	C	SAP0131 "Fire Protection Program", Rev 14B FPP022 "Fire Prevention", Rev 3 FPP020 "Program Administration", Rev 5E	FP Program impacts due to expected operational activities are described in the Fire Protection Program, and implemented in described station programs. (Table S-2, Item 1)
	(2) Design controls that restrict the use of combustible materials	C	SAP-0131, "Fire Protection Program", Rev 6D SAP-142 "Station Housekeeping Program" Rev 15B SAP133 "Design Control", Rev 14B FPP022 "Fire Prevention", Rev 3 Enclosure 6.2	The control of fixed and transient materials at the station are incorporated into a variety of controlled procedures, to manage the introduction and use of combustible materials at the station. (Table S-2, Item 1)

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
	The design control requirements listed in the remainder of this section shall be provided as described.	NRR		These control elements are described in summary in the following elements of the code and are documented, and implemented as part of the fire protection program.
3.3.1	**Fire Prevention for Operational Activities**			
	The fire prevention program activities shall consist of the necessary elements to address the control of ignition sources and the use of transient combustible materials during all aspects of plant operations. The fire prevention program shall focus on the human and programmatic elements necessary to prevent fires from starting or, should a fire start, to keep the fire as small as possible.	C	FPP022 "Fire Prevention", Rev 3 FPP020 "Program Administration", Rev 5E TQP-606 "General Employee Training Fire Protection Training" Rev 1A	A variety of Fire Protection and Training Program procedures manage ignition sources, combustible material and personnel response should a fire occur. (Table S-2, Item 1)
3.3.1.1	**General Fire Prevention Activities**			
	The fire prevention activities shall include but not be limited to the following program elements:	NRR		Individual elements are addressed below, but not limited to, the identified elements.
	(1) Training on fire safety information for all employees and contractors including, as a minimum, familiarization with plant fire prevention procedures, fire reporting, and plant emergency alarms.	C	TQP-606 "General Employee Training Fire Protection Training" Rev 1A	The Fire Protection Training Program for all employees and contractors is designed to familiarize personnel with their responsibilities associated with fire events at the station. (Table S-2, Item 4) (Table S-2, Item 17)
	(2) * Documented plant inspections including provisions for corrective actions for conditions where unanalyzed fire hazards are identified.	C	QSP-208 "Inspection of Housekeeping and Items in Storage", Rev 14 SAP142 "Station Housekeeping Program", Rev 15B QSP-106 "Conduct of Quality Assurance Activities", Rev 17B VCSNS Technical Specifications-Audits Sections 6.5.2.8	Plant inspections are conducted in accordance with a variety of station procedures. Corrective Actions are specified within the scope of the procedure.

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
	(3) * Administrative controls addressing the review of plant modifications and maintenance to ensure that both fire hazards and the impact on plant fire protection systems and features are minimized.	C	SAP-0131, "Fire Protection Program", Rev 6D SAP133 "Design Control", Rev 14B SSP-001 "Planning and Scheduling Maintenance Activities", Rev 22 SSP-002 "Planning and Scheduling of Outage Maintenance Activities" (PSE), Rev 6 ES-427 "Program Issue Screening" Rev 2D	Oversight of potential impacts on the Fire Protection Program, which includes the identification of fire hazards and potential impacts on systems/ features are controlled. (Table S-2, Item 15) (Table S-2, Item 16)
3.3.1.2	**Control of Combustible Materials**			
3.3.1.2	Procedures for the control of general housekeeping practices and the control of transient combustibles shall be developed and implemented. These procedures shall include but not be limited to the following program elements:	C	QSP-208 "Inspection of Housekeeping and items in Storage", Rev 14 SAP1286 "Procurement of Materials" Rev 7B SAP-142 "Station Housekeeping Program" Rev 15B	Individual elements are addressed below, but not limited to these elements.
	(1) * Wood used within the power block shall be listed pressure-impregnated or coated with a listed fire-retardant application. Exception: Cribbing timbers 6 in. by 6 in. (15.2 cm by 15.2 cm) or larger shall not be required to be fire-retardant treated.	CA	FPP022 "Fire Prevention", Rev 3 TRP-02, "Fire Protection", Rev 8D	Station procedures limit the type and use of wood at the station to that described. The procurement of wood is incorporated as Fire Protection Program input into the procurement process. Untreated wood or lumber will be addressed for controls of limited duration, when required, as part of the fire protection program (e.g. outages, compensatory measures) (Table S-2, Item 1)

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
	(2) Plastic sheeting materials used in the power block shall be fire-retardant types that have passed NFPA 701, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films, large-scale tests, or equivalent.	C	FPP022 "Fire Prevention", Rev 3 Enclosure 6.2 TRP-02, "Fire Protection", Rev 8D	Station procedures limit the type and use of plastic sheeting materials at the station, to those with qualified test methods as described. Information concerning restrictions concerning the procurement plastic sheeting has been addressed as Fire Protection inputs to the procurement process. (Table S-2, Item 1)
	(3) Waste, debris, scrap, packing materials, or other combustibles shall be removed from an area immediately following the completion of work or at the end of the shift, whichever comes first.	C	SAP-0300 "Conduct of Maintenance", Rev 12C, Section 6.1.17 SAP-0142 "Station Housekeeping Program", Rev 15B	Station Maintenance procedures require area cleanup following completion of maintenance activities. (Table S-2, Item 1)
	(4) * Combustible storage or staging areas shall be designated, and limits shall be established on the types and quantities of stored materials.	C	SAP-0142 "Station Housekeeping Program", Rev 15B FPP022 "Fire Prevention", Rev 3 Enclosure 6.2	Station administrative procedures control the designation and management of Combustible Material Storage and Staging Areas (Table S-2, Item 1)
	(5) * Controls on use and storage of flammable and combustible liquids shall be in accordance with NFPA 30, Flammable and Combustible Liquids Code, or other applicable NFPA standards.	C CE	SAP-0131, "Fire Protection Program", Rev 6D SAP-0403 "Chemical Control Program", Rev 8 FPP022 "Fire Prevention", Rev 3 Enclosure 6.2 DC0780D-006 "Administrative and Program Controls"	Station Administrative and Fire Protection procedures control the use and storage of Flammable/ Combustible Liquids. Programmatic controls have been evaluated against the requirements of NFPA30. No other standards, other than NFPA30, are applicable to the use and storage of Flammable and Combustible Liquids at the station. (Table S-2, Item 1)

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Section	Section Description	Disposition	Reference Document	Results Summary
	(6) * Controls on use and storage of flammable gases shall be in accordance with applicable NFPA standards.	C CE	ISP-001 "Administration of Safety Program", Rev 8B FPP022 "Fire Prevention", Rev 3 DC0780D-006 "Administrative and Program Controls"	Per FAQ 06-0020, the station maintains administrative controls for compressed gases in accordance with the original NRC guidance provided by the 'Nuclear Plant Fire Protection Functional Responsibilities, Administrative Controls, and Quality Assurance' dated June 14, 1977 with the NRC's evaluation in NUREG 0717 "Safety Evaluation Report related to the operation of Virgil C Summer Nuclear Station, Unit No. 1", dated February 1981 (page 9-43). No NFPA standards were determined to be applicable at the time. Bulk storage of flammable gases has been evaluated against the requirements of NFPA 50A-73, "Gaseous Hydrogen Systems at Consumer Sites" (Table S-2, Item 1)
3.3.1.3	**Control of Ignition Sources**			
3.3.1.3.1*	A hot work safety procedure shall be developed, implemented, and periodically updated as necessary in accordance with NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, and NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.	C CE	FPP022 "Fire Prevention", Rev 3 DC0780D-006 "Administrative and Program Controls"	Administrative controls have been developed and implemented to permit, and manage Hot Work Permits. Programmatic controls have been evaluated against the requirements of NFPA 51B and applicable NFPA 241 criteria. (Table S-2, Item 1)
3.3.1.3.2	Smoking and other possible sources of ignition shall be restricted to properly designated and supervised safe areas of the plant.	C	FPP022 "Fire Prevention", Rev 3 MD-64 "Smoking Policy-Personnel Located Within The Nuclear Strategic Business Unit" Rev 7	Smoking at the station is restricted to approved locations. Other sources of ignition are controlled through Hot Work Permit. (Table S-2, Item 1)

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
3.3.1.3.3	Open flames or combustion-generated smoke shall not be permitted for leak or air flow testing.	C	FPP022 "Fire Prevention", Rev 3	FP administrative procedures prohibit the use of open flame or combustion-generated smoke for use in leak and air flow testing (Table S-2, Item 1)
3.3.1.3.4*	Plant administrative procedure shall control the use of portable electrical heaters in the plant. Portable fuel-fired heaters shall not be permitted in plant areas containing equipment important to nuclear safety or where there is a potential for radiological releases resulting from a fire.	C	FPP022 "Fire Prevention", Rev 3	FP administrative procedures manage the use, and installation of portable heaters in the plant consistent with that described in this section. (Table S-2, Item 1)
3.3.2	**Structural**			
	Walls, floors, and components required to maintain structural integrity shall be of noncombustible construction, as defined in NFPA 220, Standard on Types of Building Construction.	C	Drawings 400 Series "Concrete" Drawings 500 Series "Structural Steel" Drawings 100 Series "Architectural" Drawing DC0780D-007 "General Station Construction Features & Materials"	The structural members of buildings are constructed of non-combustible or limited combustible materials. Structural and concrete station drawings provide applicable construction details.
3.3.3	**Interior Finishes**			
	Interior wall or ceiling finish classification shall be in accordance with NFPA 101®, Life Safety Code®, requirements for Class A materials. Interior floor finishes shall be in accordance with NFPA 101 requirements for Class I interior floor finishes.	C CE	SAP-0131, "Fire Protection Program", Rev 6D DC0780D-009 "Life Safety"	Station changes and materials are reviewed for limitations imposed by Interior finishes as described in NFPA 101. Programmatic controls associated with interior finishes have been evaluated against the requirements of NFPA 101, Life Safety Code. (Table S-2, Item 3)
3.3.4	**Insulation Materials**			

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Section	Section Description	Disposition	Reference Document	Results Summary
	Thermal insulation materials, radiation shielding materials, ventilation duct materials, and soundproofing materials shall be noncombustible or limited combustible.	C	SP-138, "Insulation Outside Containment", Rev 3, Section 5:03 SP-136, "Insulation Inside Containment", Rev 3 SP-424, "Insulation Outside Containment" Rev 0	Thermal insulating materials are heat resistant and non-combustible or limited combustible materials. There are no soundproofing materials. SP138 references ASTM C547 & C553 for mineral wool and SP424 requires fiberglass blankets. Ventilation duct materials are mineral fiber (SP424). Radiation shielding materials are non combustible or limited combustible (Table S-2, Item 3)
3.3.5	**Electrical**			
3.3.5.1	Wiring above suspended ceiling shall be kept to a minimum. Where installed, electrical wiring shall be listed for plenum use, routed in armored cable, routed in metallic conduit, or routed in cable trays with solid metal top and bottom covers.	CE	SP-222 "Electrical Installation", Rev 16 TR0780E-004 "Administrative Features & Materials: Electrical Wiring and Cabling", Rev 0 EMP-391.001: "Installation of conduit", Rev 7 EMP-300.003: "Installation of flexible conduit" Rev 13B SP-371 "Communication Cable", Rev 0 SP-372 "Lighting Cable", Rev 0	Station specifications and procedures govern the installation wiring above suspended ceilings, which is kept to a minimum. These specifications and procedures require wire and cable installed in NFPA 805 credited areas to be qualified to IEEE 383 flame test or be plenum rated. Future wiring in this type space for the Power Block are listed for plenum use, routed in armored cable, routed in metallic conduit or routed in cable trays with solid metal top and bottoms covers. (Table S-2, Item 3)
3.3.5.2	Only metal tray and metal conduits shall be used for electrical raceways. Thin wall metallic tubing shall not be used for power, instrumentation, or control cables. Flexible metallic conduits shall only be used in short lengths to connect components.	C	SP-222 "Electrical Installation", Rev 16 Drawing 215-001, Rev 25 SP- 558 "Cable Tray", Addendum A Drawing 214-001, Rev 15 Drawing 215-002, Sheet 2, Rev 16	Raceways including cable trays and conduit are constructed of metal tray or conduit. Thin wall metallic tubing is not used for power, instrumentation or control cables. When used, flexible metallic conduits are only used in limited lengths.
3.3.5.3*	Electric cable construction shall comply with a flame propagation test as acceptable to the	CE	SP-222 "Electrical Installation", Rev 16	Electrical cable insulation of all purpose cable is qualified by flame propagation testing

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Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
	AHJ.		SP-371 "Communication Cable", Rev 0 SP-372 "Lighting Wire" Rev 0 SP-374 "Paging System" Rev 0 SP-1511 "Procurement and Installation of Rockbestos Firezone R Cable" Rev 0 TR0780E-004 "FP Admin Features & Program Controls", Rev 0	acceptable to the AHJ (FAQ06-022). Engineering documents control cable construction to comply with the subject attributes. Very small amounts of untested special purpose cable are installed but do not result in a significant fire risk (Table S-2, Item 3) Recognition of alternative flame propagation test methods (FAQ06-022) is captured in the evaluation for future station reference/ configuration control.
3.3.6	**Roofs**			
	Metal roof deck construction shall be designed and installed so the roofing system will not sustain a self-propagating fire on the underside of the deck when the deck is heated by a fire inside the building. Roof coverings shall be Class A as determined by tests described in NFPA 256, Standard Methods of Fire Tests of Roof Coverings.	CA	SP-112 "Plant Enclosures", Rev 0 Drawing SP-152 "Roof Insulation, Built Up Roofing and Sheet Metal" Rev 3 DC0780D-006 "Administrative and Program Controls"	Metal deck roof construction is noncombustible and is listed as Class I by the Factory Mutual System Approval Guide. (FM Global Property Loss Prevention Data Sheets 1-31, Metal Roof Systems) or Class A (NFPA 256). (Table S-2, Item 3)
3.3.7	**Bulk Flammable Gas Storage**			
	Bulk compressed or cryogenic flammable gas storage shall not be permitted inside structures housing systems, equipment, or components important to nuclear safety.	C	FPP022 "Fire Prevention", Rev 3 SAP-133 "Design Control", Rev 14B	Bulk compressed or cryogenic flammable gases are stored outside station structures (Table S-2, Item 1)
3.3.7.1	Storage of flammable gas shall be located outdoors, or in separate detached buildings, so that a fire or explosion will not adversely impact systems, equipment, or components important to nuclear safety. NFPA 50A, Standard for Gaseous Hydrogen Systems at Consumer Sites, shall be followed for hydrogen storage.	C CE	FPP022 "Fire Prevention", Rev 3 DC0780D-006 "Administrative Features & Materials", Rev 0	Flammable gases are stored outside station structures or in separate detached buildings. Bulk storage of flammable gases has been evaluated against the requirements of NFPA 50A-73, "Gaseous Hydrogen Systems at Consumer Sites" (Table S-2, Item 1)

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Section	Section Description	Disposition	Reference Document	Results Summary
3.3.7.2	Outdoor high-pressure flammable gas storage containers shall be located so that the long axis is not pointed at buildings.	C CE	Drawing 011-001 "Transformer Area" Rev 11 TR0780E-006 "Fire Protection Admin and Program Controls"	Bulk high pressure flammable storage containers are normally located such that the long axis is parallel to site structures. The generator hydrogen storage tank south of the Turbine Building is perpendicular to the Turbine Building, but spatially separated from the building (>200 feet) and discussed in the engineering evaluation.
3.3.7.3	Flammable gas storage cylinders not required for normal operation shall be isolated from the system.	C	FPP022 "Fire Prevention", Rev 3 WM-3.0 "Welding Safety" Rev 6B, Section 5.1.10	When not in use portable compressed gas cylinders are isolated (Table S-2, Item 1)
3.3.8	**Bulk Storage of Flammable and Combustible Liquids** Bulk storage of flammable and combustible liquids shall not be permitted inside structures containing systems, equipment, or components important to nuclear safety. As a minimum, storage and use shall comply with NFPA 30, Flammable and Combustible Liquids Code.	C CE	FPP022 "Fire Prevention", Rev 3 PTP-114.091 "Flammable Liquid Locker Inspection", Rev 3C SAP-142 "Station Housekeeping Program" Rev 15B DC0780D-006 "Administrative and Program Controls"	Administrative procedures prohibit the bulk storage of flammable and combustible liquids inside site structures. Bulk storage of flammable and combustible liquids has been evaluated against the requirements of NFPA 30, "Flammable and Combustible Liquids Code" (Table S-2, Item 1)
3.3.9*	**Transformers** Where provided, transformer oil collection basins and drain paths shall be periodically inspected to ensure that they are free of debris and capable of performing their design function.	C	PTP 114.073 "Transformer Deluge Operational Test" Rev 6 TR07800-013 "Transformer Hazards Analysis SOER10-1", Rev 0	Visual inspections are performed during periodic transformer water spray testing to assess collection basis and drain path performance. A Fire Hazard Evaluation of the Transformer area considered drainage alternatives to that cited in this section. (Table S-2, Item 2)

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Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
3.3.10	**Hot Pipes and Surfaces.** Combustible liquids, including high flashpoint lubricating oils, shall be kept from coming in contact with hot pipes and surfaces, including insulated pipes and surfaces. Administrative controls shall require the prompt cleanup of oil on insulation.	C	FPP022 "Fire Prevention", Rev 3 SAP-142 "Station Housekeeping Program" Rev 15B QSP-208 "Inspection of Housekeeping and Items In Storage", Rev 14 SAP1256 "Leak Reduction Program", Rev 1	Administrative procedures ensure the prompt identification and correction of any combustible liquid leakage at the station, which would include hot pipes and surfaces. This would include housekeeping considerations with the use of combustible liquids during maintenance periods. (Table S-2, Item 1)
3.3.11	**Electrical Equipment.** Adequate clearance, free of combustible material, shall be maintained around energized electrical equipment.	C	FPP022 "Fire Prevention", Rev 3 QSP-208 "Inspection of Housekeeping and Items In Storage", Rev 14, SAP-142 "Station Housekeeping Program" Rev 15B	Placement of combustible materials in proximity to energized electrical equipment is controlled. (Table S-2, Item 1)
3.3.12	**Reactor Coolant Pumps.** For facilities with non-inerted containments, reactor coolant pumps with an external lubrication system shall be provided with an oil collection system. The oil collection system shall be designed and installed such that leakage from the oil system is safely contained for off normal conditions such as accident conditions or earthquakes. All of the following shall apply:	C	Drawing 305-601 Sheet 1, Reactor Coolant Pump A Oil Collection Systems Rev 1 Drawing 305-601 Sheet 2, Reactor Coolant Pump B Oil Collection Systems Rev 1 Drawing 305-601 Sheet 3, Reactor Coolant Pump C Oil Collection Systems Rev 1 302-606 "RCP Oil Collection System" Rev 1 FR DBD "10CFR50 Appendix R", Rev 4F, Section 4.1	The RCP oil collection system has been designed, engineered and installed that failure will not lead to fire during normal or design basis accident conditions and that there is reasonable assurance that the system will withstand the Safe Shutdown Earthquake (10 CFR 50, Appendix R, Section III O). The system meets the five criteria presented in this section. A stress margin exists for the pump enclosures, the drain piping, and the collection tank in that the stress ratios during an SSE are less than 1.00. Components of the oil collection system could survive earthquakes of greater magnitude than that postulated in the analysis.
	(a) The oil collection system for each reactor coolant pump shall be capable of collecting lubricating oil from all potential pressurized and non pressurized leakage sites in each	C	Drawing 305-601 Sheet 1, Reactor Coolant Pump A Oil Collection Systems Rev 1 Drawing 305-601 Sheet 2,	The RCP oil collection system is designed to collect oil from pressurized and non pressurized leakage sites.

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Section	Section Description	Disposition	Reference Document	Results Summary
	reactor coolant pump oil system.		Reactor Coolant Pump B Oil Collection Systems Rev 1 Drawing 305-601 Sheet 3, Reactor Coolant Pump C Oil Collection Systems Rev 1 302-606 "RCP Oil Collection System" Rev 1 FR DBD "10CFR50 Appendix R", Rev 4F, Section 4.1	
	(b) Leakage shall be collected and drained to a vented closed container that can hold the inventory of the reactor coolant pump lubricating oil system.	C	Drawing 305-601 Sheet 1, Reactor Coolant Pump A Oil Collection Systems Rev 1 Drawing 305-601 Sheet 2, Reactor Coolant Pump B Oil Collection Systems Rev 1 Drawing 305-601 Sheet 3, Reactor Coolant Pump C Oil Collection Systems Rev 1 302-606 "RCP Oil Collection System" Rev 1 FR DBD "10CFR50 Appendix R", Rev 4F, Section 4.1	The RCP oil collection system is designed to collect leakage, and drain to a vented closed container, sized to hold the contents of the RCP lubricating system. The individual tank capacities of 275 gallons account for any pump overfill or tank condensation which could occur.
	(c) A flame arrestor is required in the vent if the flash point characteristics of the oil present the hazard of a fire flashback.	C	Drawing 305-601 Sheet 1, Reactor Coolant Pump A Oil Collection Systems Rev 1 Drawing 305-601 Sheet 2, Reactor Coolant Pump B Oil Collection Systems Rev 1 Drawing 305-601 Sheet 3, Reactor Coolant Pump C Oil Collection Systems Rev 1 302-606 "RCP Oil Collection System" Rev 1 FR DBD "10CFR50 Appendix R", Rev 4F, Section 4.1	A flame arrestor has been installed on the vent for the RCP oil drainage tank.

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Section	Section Description	Disposition	Reference Document	Results Summary
	(d) Leakage points on a reactor coolant pump motor to be protected shall include but not be limited to the lift pump and piping, overflow lines, oil cooler, oil fill and drain lines and plugs, flanged connections on oil lines, and the oil reservoirs, where such features exist on the reactor coolant pumps.	C	Drawing 305-601 Sheet 1, Reactor Coolant Pump A Oil Collection Systems Rev 1 Drawing 305-601 Sheet 2, Reactor Coolant Pump B Oil Collection Systems Rev 1 Drawing 305-601 Sheet 3, Reactor Coolant Pump C Oil Collection Systems Rev 1	The RCP oil collection system is designed to encompass the defined potential leakage points for the oil lubrication system.
	(e) The collection basin drain line to the collection tank shall be large enough to accommodate the largest potential oil leak such that oil leakage does not overflow the basin.	C	Drawing 305-601 Sheet 1, Reactor Coolant Pump A Oil Collection Systems Rev 1 Drawing 305-601 Sheet 2, Reactor Coolant Pump B Oil Collection Systems Rev 1 Drawing 305-601 Sheet 3, Reactor Coolant Pump C Oil Collection Systems Rev 1 302-606 "RCP Oil Collection System" Rev 1 FR DBD "10CFR50 Appendix R", Rev 4F, Section 4.1	The RCP oil collection system basin drain line is sized to accommodate the largest potential oil leak. ECR-50371 & Appendix R DBD evaluates the potential spill into the basin.
3.4	**Industrial Fire Brigade**			
3.4.1	**On-Site Fire-Fighting Capability**			
	(a) A fully staffed, trained, and equipped fire-fighting force shall be available at all times to control and extinguish all fires on site. This force shall have a minimum complement of five persons on duty and shall conform with the following NFPA standards as applicable:	C	SAP-131 "Fire Protection Program", Rev 6D TQP-606 "General Employee Training Fire Protection Training", Rev 1A Drawing DC0780D-009 "Industrial Fire Brigade" OAP100.6 " Control Room Conduct and Control of Shift Activities" Attachment VIIA Rev	A fully staffed, trained and equipped five (5) man fire brigade is available at all times to respond to, control and extinguish fires on site.

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	Section Description	Disposition	Reference Document	Results Summary
			2E	
	(1) NFPA 600, Standard on Industrial Fire Brigades (Interior Structural Fire Fighting)	CE	EPP-107 "Fire Brigade", Rev 0A TQP-606 "General Employee Training Fire Protection Training", Rev 1A DC0780D-008 Industrial Fire Brigade, Rev 0	The station fire brigade has been evaluated against the requirements of NFPA 600, "Standard on Industrial Fire Brigades"
	(2) NFPA 1500, Standard on Fire Department Occupational Safety and Health Program	NRR		NFPA600 is used for the Industrial Fire Brigade.
	(3) NFPA 1582, Standard on Medical Requirements for Fire Fighters and Information for Fire Department Physicians	NRR	FAQ 06-007 "Clarification on Plant Fire Brigades" DC0780D-008 Industrial Fire Brigade, Rev 0	This standard applies to fire department organizations only. VCSNS is organized as a fire brigade.
	(b) * Industrial fire brigade members shall have no other assigned normal plant duties that would prevent immediate response to a fire or other emergency as required.	C	EPP-107 "Fire Brigade", Rev 0A DC0780D-008 Industrial Fire Brigade , Rev 0	During an event requiring fire brigade response (e.g. station fire), the assigned fire brigade members primary responsibility is to support timely response/ resolution to the event.
	(c) During every shift, the brigade leader and at least two brigade members shall have sufficient training and knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance **Exception:** Sufficient training and knowledge shall be permitted to be provided by an operations advisor dedicated to industrial fire brigade support criteria.	C	SAP-200 "Conduct of Operations", Rev 8E Enclosure A OAP100.6 "Control Room Conduct and Control of Shift Activities", Rev 2E Attachment VIIA DC0780D-008 Industrial Fire Brigade , Rev 0	At the start of every shift, qualifications of the Fire Brigade is verified to ensure that at least the Fire Brigade Leader and at least two Fire Brigade members have sufficient knowledge of nuclear safety systems to understand the effects of fire and fire suppressants on nuclear safety performance, unless the Exception is used (Table S-2, Item 6)
	(d) * The industrial fire brigade shall be notified immediately upon verification of a fire.	CA	EPP-013 "Fire Emergency", Rev 8 DC0780D-009 Industrial Fire Brigade	The Control Room notifies the Fire Brigade upon verification of a fire.

Section	Section Description	Disposition	Reference Document	Results Summary
	(e) Each industrial fire brigade member shall pass an annual physical examination to determine that he or she can perform the strenuous activity required during manual fire-fighting operations. The physical examination shall determine the ability of each member to use respirator.	C	SAP-1160 "Medical Requirements for Special Duties", Rev 9B Enclosure E Fire Brigade Members	An annual physical examination is conducted to assure each Fire Brigade member is qualified for respirator use. The annual physical examination is also conducted to assure the Fire Brigade Member can perform the strenuous activity required during manual fire fighting operations (Table S-2, Item 6)
3.4.2*	**Pre-Fire Plans:** Current and detailed pre-fire plans shall be available to the industrial fire brigade for all areas in which a fire could jeopardize the ability to meet the performance criteria described in Section 1.5.	C	SAP-131 "Fire Protection Program", Rev 6D	Current, detailed Fire Pre-Plans are available to the Fire Brigade Leader and Control Room personnel supporting the response to a fire event at the station (Table S-2, Item 5)
3.4.2.1*	The plans shall detail the fire area configuration and fire hazards to be encountered in the fire area, along with any nuclear safety components and fire protection systems and features that are present.	C	FPP031"Development and Control of Fire Protection Preplans , Rev 3B	Fire Pre-Plans provide graphic and text representation of area configuration, area hazards, FP Features and major nuclear safety components. (Table S-2, Item 5)
3.4.2.2	Pre-fire plans shall be reviewed and updated as necessary.	C	FPP031"Development and Control of Fire Protection Preplans , Rev 3B MD-21 "Configuration Management", Rev 7 SAP-131 "Fire Protection Program", Rev 6D SAP-133 "Design Control Program", Rev 14B EPP-13 "Fire Emergency", Rev 8	Station Modifications (e.g. Interface Review) and Fire Drill Critique (e.g. Corrective Actions) are mechanisms employed for Fire Pre-Plan usability, accuracy and improvements (Table S-2, Item 5)
3.4.2.3*	Pre-fire plans shall be available in the control room and made available to the plant industrial fire brigade.	C	SAP-131 "Fire Protection Program", Rev 6D	Current, detailed Fire Pre-Plans are available to the Fire Brigade Leader and Control Room personnel supporting the response to a fire event at the station (Table S-2, Item 5)

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Section	Section Description	Disposition	Reference Document	Results Summary
3.4.2.4*	Pre-fire plans shall address coordination with other plant groups during fire emergencies.	CA	EPP-013 "Fire Emergency", Rev 8 TQP-606 "General Employee Training Fire Protection Training" Rev 1A	Station fire response procedures and Fire Brigade Leader Training discuss coordination with other groups during fire emergencies.
3.4.3	**Training and Drills**			
	Industrial fire brigade members and other plant personnel who would respond to a fire in conjunction with the brigade shall be provided with training commensurate with their emergency responsibilities.	C	TQP-606 "General Employee Training Fire Protection Training" Rev 1A EPP-013 "Fire Emergency", Rev 8 EP-100 "Radiation Emergency Plan" Rev 59	Fire Brigade and other support personnel are trained commensurate with their emergency responsibilities. (Table S-2, Item 6) (Table S-2, Item 7)
(a)	Plant Industrial Fire Brigade Training. All of the following requirements shall apply:	NRR		Elements of the fire prevention program are described in the following subsections.
	(1) Plant industrial fire brigade members shall receive training consistent with the requirements contained in NFPA 600, Standard on Industrial Fire Brigades, or NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, as appropriate.	CE	TQP-606 "General Employee Training Fire Protection Training" Rev 1A DC0780D-009 "Industrial Fire Brigade", Rev 0	The station fire brigade has been evaluated against the requirements of NFPA 600, "Standard on Industrial Fire Brigades" (Table S-2, Item 6)
	(2) Industrial fire brigade members shall be given quarterly training and practice in fire fighting, including radioactivity and health physics considerations, to ensure that each member is thoroughly familiar with the steps to be taken in the event of a fire.	C	EPP-107 "Fire Brigade", Rev 0A TQP-606 "General Employee Training Fire Protection Training" Rev 1A	Quarterly training and practice is conducted in fire fighting, including radioactivity and health physics considerations.
	(3) A written program shall detail the industrial fire brigade training program.	C	TQP-606 "General Employee Training Fire Protection Training" Rev 1A	The fire brigade training program is documented in the station training procedure
	(4) Written records that include but are not limited to initial industrial fire brigade	CA	Electronic Training Qualification Program (Plateau)	Electronic Records are maintained for each Fire Brigade Member for Fire Brigade of

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
	classroom and hands-on training, refresher training, special training schools attended, drill attendance records, and leadership training for industrial fire brigades shall be maintained for each industrial fire brigade member.		TQP-409 "Implementation of Training" Rev 0D SAP-126, "Transmittal and Maintenance of Records" Rev 3A TQP-1004 "Training Documentation and Records", Rev 1A	training related activities including, but not limited to, classroom sessions, schools, drills and other related topics.
(b)	Training for Non-Industrial Fire Brigade Personnel. Plant personnel who respond with the industrial fire brigade shall be trained as to their responsibilities, potential hazards to be encountered, and interfacing with the industrial fire brigade.	C	EPP-013 "Fire Emergency", Rev 8	Fire Brigade support personnel are trained commensurate with their emergency responsibilities, potential hazards and interfacing with the Fire Brigade. (Table S-2, Item 7)
(c)	* Drills. All of the following requirements shall apply. (1) Drills shall be conducted quarterly for each shift to test the response capability of the industrial fire brigade.	C	EPP-107 "Fire Brigade", Rev 0A	Fire Brigade Drills are conducted on a quarterly basis for each shift
	(2) Industrial fire brigade drills shall be developed to test and challenge industrial fire brigade response, including brigade performance as a team, proper use of equipment, effective use of pre-fire plans, and coordination with other groups. These drills shall evaluate the industrial fire brigade's abilities to react, respond, and demonstrate proper fire-fighting techniques to control and extinguish the fire and smoke conditions being simulated by the drill scenario.	C	EPP-107 "Fire Brigade", Rev 0A	Fire Brigade Drills are conducted with the cited specific objectives to assess adequacy of Fire Brigade response as a team during the drill scenario.
	(3) Industrial fire brigade drills shall be conducted in various plant areas, especially in those areas identified to be essential to plant operation and to contain significant fire hazards.	C	EPP-107 "Fire Brigade", Rev 0A	Guidance concerning the development of Fire Brigade Drills, including important considerations (e.g. essential to plant operations, significant fire hazards) concerning drill scenario development are defined in

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Section	Section Description	Disposition	Reference Document	Results Summary
				station procedures. (Table S-2, Item 7)
	(4) Drill records shall be maintained detailing the drill scenario, industrial fire brigade member response, and ability of the industrial fire brigade to perform as a team.	C	EPP-107 "Fire Brigade", Rev 0A	Station procedures define the maintenance requirements for Fire Brigade Drill Records for the Fire Brigade Members including the cited requirements. (Table S-2, Item 7)
	(5) A critique shall be held and documented after each drill.	C	EPP-107 "Fire Brigade", Rev 0A	A critique is held and documented following each Fire Brigade Drill.
3.4.4	**Fire-Fighting Equipment**			
	Protective clothing, respiratory protective equipment, radiation monitoring equipment, personal dosimeters, and fire suppression equipment such as hoses, nozzles, fire extinguishers, and other needed equipment shall be provided for the industrial fire brigade. This equipment shall conform with the applicable NFPA standards.	C CE	SAP-131 "Fire Protection Program", Rev 6D DC0780D-001 "NFPA Code of Record", Enclosure C, Rev 0	Station procedures ensure that Fire Brigade personnel are provided with protective clothing and appropriate equipment. When acquired, the equipment conforms to applicable NFPA Standards. These standards are identified in the identified evaluation (Table S-2, Item 19)
3.4.5	**Off-Site Fire Department Interface**			
3.4.5.1	**Mutual Aid Agreement**			
	Off-site fire authorities shall be offered a plan for their interface during fires and related emergencies on site.	C	EP-100, "Radiation Emergency Plan" Letters of Agreement (EP), Rev 59 South Carolina Emergency Operation Plan, Annex 4, Feb 2010	Mutual Aid agreements have been established (Letter Agreements) with offsite organizations to respond to the station. A plan for that interface during fire emergencies has been provided to off site fire authorities. (Table S-2, Item 7)
3.4.5.2*	**Site-Specific Training**			
	Fire fighters from the off-site fire authorities who are expected to respond to a fire at the plant shall be offered site-specific training and shall be invited to participate in a drill at least annually.	C	EP-100 "Radiation Emergency Plan" Rev 59 C-FP-19 "Indoctrination of Offsite Fire Department" EPP-107 "Fire Brigade", Rev 0A	Offsite fire companies are offered site specific training and are invited to a Fire Brigade Drill at least annually. Attendance records are recorded in the station records system. (Table S-2, Item 7)

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
3.4.5.3*	**Security and Radiation Protection**			
	Plant security and radiation protection plans shall address off-site fire authority response.	C	EPP-013 "Fire Emergency", Rev 8 EP-100 "Radiation Emergency Plan" Rev 59 SSP-114 "Security Force Responsibilities During Emergencies" Rev 14	Fire, Radiological and Security Emergency plans include roles and provisions for assistance to Off-Site fire authorities at the annual drills and offsite assistance is escorted upon arrival.
3.4.6*	**Communications**			
	An effective emergency communications capability shall be provided for the industrial fire brigade.	C	EPP013 "Fire Emergency", Rev 15A ECR71553 Fire Communication System	An effective communication system has been provided to support fire fighting operations. Primary communication is over the station page system, while radio communication serve to support direct communication with the Fire Brigade Leader (Table S-2, Item 8)
3.5	**Water Supply**			
3.5.1	A fire protection water supply of adequate reliability, quantity, and duration *shall be provided by one of the two following methods.*	NRR		Individual elements are addressed in the following sections
	(a) Provide a fire protection water supply of not less than two separate 300,000-gal (1,135,500-L) supplies, or (b)	NRR	N/A	A single water supply source via Lake Monticello, provides the water supply to the Fire Protection water distribution system. This option not selected.

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Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
	(b) Calculate the fire flow rate for 2 hours. This fire flow rate shall be based on 500 gpm (1892.5 L/min) for manual hose streams plus the largest design demand of any sprinkler or fixed water spray system(s) in the power block as determined in accordance with NFPA 13, Standard for the Installation of Sprinkler Systems, or NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection. The fire water supply shall be capable of delivering this design demand with the hydraulically least demanding portion of fire main loop out of service.	C	DC07810-015 "Intermediate Building 412' & 436' Sprinkler System Hydraulic Analysis", rev 2 (Typical), VCSNS DBD "Fire Protection System" (FS), Rev 2E Table 6.2-1 "Fire Water Demand"	The size of the Monticello Reservoir greatly exceeds maximum fire flow demands including automatic systems and manual hose streams for 2 hours. The water supply system is capable of delivering water at sufficient flow and pressure with the hydraulically demanding leg of the distribution system out of service.
3.5.2*	The tanks shall be interconnected such that fire pumps can take suction from either or both. A failure in one tank or its piping shall not allow both tanks to drain. The tanks shall be designed in accordance with NFPA 22, Standard for Water Tanks for Private Fire Protection. Exception No. 1: Water storage tanks shall not be required when fire pumps are able to take suction from a large body of water (such as a lake), provided each fire pump has its own suction and both suctions and pumps are adequately separated. Exception No. 2: Cooling tower basins shall be an acceptable water source for fire pumps when the volume is sufficient for both purposes and water quality is consistent with the demands of the fire service.	NRR		Water storage tanks are not used as the primary water supply source for the Fire Protection Water Distribution System

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Section	Section Description	Disposition	Reference Document	Results Summary
3.5.3*	Fire pumps, designed and installed in accordance with NFPA 20, Standard for the Installation of Stationary Pumps for Fire Protection, shall be provided to ensure that 100 percent of the required flow rate and pressure are available assuming failure of the largest pump or pump power source.	C CE	Drawing 302-231 Sht 1 "Fire Service Pumps", Rev 37 DC0780D-003 "Automatic Fire Suppression", Rev 0	The Diesel Engine Driven and Electric Motor Driven Fire pumps are designed and installed to individually supply 100 percent of the required flow rate and pressure. Fire pumps are designed and installed in accordance with NFPA 20. The fire pumps has been evaluated against the requirements of NFPA 20, "Standard for the Installation of Stationary Pumps for Fire Protection"
3.5.4	At least one diesel engine-driven fire pump or two more seismic Category I Class IE electric motor-driven fire pumps connected to redundant Class IE emergency power buses capable of providing 100 percent of the required flow rate and pressure shall be provided.	C	XPP0134B, Diesel Engine Driven Fire Pump Drawing 302-231 Sht 1 "Fire Service Pumps", Rev 37	A single, diesel engine-driven fire pump is provided that is capable of supplying the required flow rate and pressure.
3.5.5	Each pump and its driver and controls shall be separated from the remaining fire pumps and from the rest of the plant by rated fire barriers.	C CE	Drawing 126-001 "CW Pump House Plans" Rev 7 TR0780E-006 Fire Protection Features: FPEE Fire Pump Separation, Rev 0 Fire Protection Evaluation Report, Section 5.E.2(c)	The fire pumps are separated by three-hour rated barriers in the circulating water pump house. The electric fire pump, driver and controller are not separated from all other plant equipment by rated fire barriers. This was previously described in our response to APCSB 9.5-1 Appendix A, Section E.2 Fire Protection Water Supply Systems, item (c) where we indicated "The diesel-driven fire pump is separated from the electric motor-driven fire pump by a 3 hour rated fire barrier in the circulating water intake screen and pumphouse"
3.5.6	Fire pumps shall be provided with automatic start and manual stop only.	C	SP-360 "1974 Fire Pumps"	Each of the two fire pumps is coordinated to start on a drop in system pressure, and require manual action at the respective pump controller to stop the pump.

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
3.5.7	Individual fire pump connections to the yard fire main loop shall be provided and separated with sectionalizing valves between connections.	C	Drawing 302-231 Sheets 1 "Fire Service Pumps" , Rev 37 Drawing 302-231 Sheets 2 "Fire Service Hydrant and Loop" Rev 11	Each fire pump is provided with separate connections to the yard fire main loop with sectionalizing valves between connections.
3.5.8	A method of automatic pressure maintenance of the fire protection water system shall be provided independent of the fire pumps.	C	Drawing 302-231 Sheets 1 "Fire Service Pumps" , Rev 37 Drawing 302-231 Sheets 2 "Fire Service Hydrant and Loop" Rev 11	A jockey pump provides automatic pressure maintenance for the fire protection water system.
3.5.9	Means shall be provided to immediately notify the control room, or other suitable constantly attended location, of operation of fire pumps.	C	Drawings 228- 044 Series	The fire detection and control system in the control room provides notification of fire pump controller alarms, including "Pump Running".
3.5.10	An underground yard fire main loop, designed and installed in accordance with NFPA 24, *"Standard for the Installation of Private Fire Service Mains and Their Appurtenances"*, shall be installed to furnish anticipated water requirements.	C CE	SP-124 "Yard Fire Protection System", Rev 1 , Drawing 302-231 Sheets 1 "Fire Service Pumps" , Rev 37 Drawing 302-231 Sheets 2 "Fire Service Hydrant and Loop" Rev 11 DC0780D-003 "Automatic Fire Suppression", Rev 0	The underground yard fire main loop was designed and installed to supply manual and automatic water based suppression systems, to meet system demands. The fire protection water and distribution system has been evaluated against the requirements of NFPA 24, "Standard for the Installation of Private Fire Service Mains and Their Appurtenances"

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Section	Section Description	Disposition	Reference Document	Results Summary
3.5.11	Means shall be provided to isolate portions of the yard fire main loop for maintenance or repair without simultaneously shutting off the supply to both fixed fire suppression systems and fire hose stations provided for manual backup. Sprinkler systems and manual hose station standpipes shall be connected to the plant fire protection water main so that a single active failure or a crack to the water supply piping to these systems can be isolated so as not to impair both the primary and backup fire suppression systems.	C	Drawing 302-231 Series	System layout, including sectionalizing valves, is provided to allow isolation of various sections of the fire water system for maintenance or repair without adversely impacting primary and backup systems.
3.5.12	Threads compatible with those used by local fire departments shall be provided on all hydrants, hose couplings, and standpipe risers.	C	FS DBD "Fire Protection System", Rev 2E Section 4.1.5.4 NELPIA File No. NS-202, 1976 SP-124 "Yard Fire Protection System" Section 1:03.5	Fire hose threads provided at the station are NHT standard, which are compatible with local fire departments
	Exception: Fire departments shall be permitted to be provided with adapters that allow interconnection between plant equipment and the fire department equipment if adequate training and procedures are provided.	NRR		Exception not applicable to Water Supply system design

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Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
3.5.13	Headers fed from each end shall be permitted inside buildings to supply both sprinkler and standpipe systems, provided steel piping and fittings meeting the requirements of ANSI B31.1, Code for Power Piping, are used for the headers (up to and including the first valve) supplying the sprinkler systems where such headers are part of the seismically analyzed hose standpipe system. Where provided, such headers shall be considered an extension of the yard main system. Each sprinkler and standpipe system shall be equipped with an outside screw and yoke (OS&Y) gate valve or other approved shutoff valve.	C CE	SP-124 "Yard Fire Protection System", SP- 337 "Pipe Line Specifications for Conventional Piping" Rev 13 Line Spec175X, 176X Drawing 302-231 Series TR0780E-005 "Fire Suppression: Seismic Standpipes", Rev 0	Each interior header has a separate connection with shutoff valve to the fire protection water distribution system, and supplies both sprinkler and standpipe systems, which uses pipe and fittings meeting the requirements of ANSI B31.1. Each sprinkler and standpipe connection is provided with an OS&Y valve for isolation purposes. The standpipe and water distribution piping is not a seismically analyzed system, which was consistent with NRC Branch Technical Position (BTP) APCSB 9.5-1 Appendix A, that was applicable to VCSNS (plants docketed prior to July 1, 1976). Appendix A modified the requirements for hose standpipe systems and deleted this seismic design requirement.
3.5.14*	All fire protection water supply and fire suppression system control valves shall be under a periodic inspection program and shall be supervised by one of the following methods.	C	STP-128.002 "FP Valve Lineup", Rev 18	FP water distribution system valves are locked or sealed, and periodically inspected for position.
	(a) Electrical supervision with audible and visual signals in the main control room or other suitable constantly attended location.	NRR		Electric Supervision is not used to monitor valve position.
	(b) Locking valves in their normal position. Keys shall be made available only to authorized personnel.	C	SAP- 0140 "Plant Key Control", Rev 6A	Where valves are provided locks, keys are controlled through the Station Operations organization.
	(c) Sealing valves in their normal positions. This option shall be utilized only where valves are located within fenced areas or under the direct control of the owner/operator.	C	STP-128.002 "FP Valve Lineup", Rev 18	FP water distribution system valves are normally sealed for valves in the Owner Controlled Area.

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Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
3.5.15	Hydrants shall be installed approximately every 250 ft (76 m) apart on the yard main system. A hose house equipped with hose and combination nozzle and other auxiliary equipment specified in NFPA 24, Standard for the Installation of Private Fire Service Mains and Their Appurtenances, shall be provided at intervals of not more than 1000 ft (305 m) along the yard main system.	C CE	Drawing E-303 Series "Underground Drawings for Fire Service Piping" Drawing 302-231 Series "Fire Service Hydrants and Loop" TR0780E-005 "Fire Suppression: Fire Hydrant Separation", Rev 0 DC0780D-003 "Automatic Fire Suppression", Rev 0	Hydrants are typically spaced less than 400 feet intervals along the loop and at least 50 feet from the buildings. Hose Houses are located less than 1000 foot intervals along the yard fire main. The hose house and equipment has been evaluated against the requirements of NFPA 24, "Standard for the Installation of Private Fire Service Mains and Their Appurtenances"
	Exception: Mobile means of providing hose and associated equipment, such as hose carts or trucks, shall be permitted in lieu of hose houses. Where provided, such mobile equipment shall be equivalent to the equipment supplied by three hose houses.	NRR		A mobile means to provided hose and equipment is not relied upon, as an alternate to provide equipment to hose houses. Sufficient hose houses and equipment are located along the fire service main, to meet the requirements of 3.5.15.
3.5.16*	The fire protection water supply system shall be dedicated for fire protection use only.	C	Drawing 302-231 Series	The fire protection water supply system is a dedicated system for fire protection use. **Complies with Exception No.1 below.**
	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.	C	DC07810-030 "CB Preaction System Hydraulic Calculations", Rev 1	The water supply system is designed to deliver sufficient flow and pressure for the largest fire demand, in addition to supporting Emergency Diesel Generator cooling.
	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.	NRR		NA to the Fire Protection Water Supply System design for VCSNS

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Section	Section Description	Disposition	Reference Document	Results Summary
3.6	**Standpipe and Hose Stations**			
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.	CE	DC0780D-004 "Manual Fire Suppression", Rev 0 TR0780E-005 "Fire Suppression: Standpipe and Hose Stations" Rev 0	The hose standpipe system is designed and installed in accordance with NFPA 14. The standpipe and hose systems has been evaluated against the requirements of NFPA 14, "Standard for the Installation of Standpipe, Private Hydrant, and Hose Systems" The standpipe and water distribution piping is not a seismically analyzed system nor a Class III system, which was consistent with NRC Branch Technical Position (BTP) APCSB 9.5-1 Appendix A, that was applicable to VCSNS (plants docketed prior to July 1, 1976). Appendix A modified the requirements for hose standpipe systems and did not discuss class of service, and deleted the seismic design requirement.
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.	CA	DC07810-036 "Nozzle Pressure at Hose Reels", Rev 0	The design of the system ensures an adequate flow rate and nozzle pressure for concurrent operation of manual and fixed suppressions systems. Pressure reducers have not been provided or are necessary. Training of fire brigade members addresses high pressure nature of the system.

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Section	Section Description	Disposition	Reference Document	Results Summary
3.6.3	The proper type of hose nozzle to be supplied to each power block area shall be based on the area fire hazards. The usual combination spray/straight stream nozzle shall not be used in areas where the straight stream can cause unacceptable damage or present an electrical hazard to fire-fighting personnel. Listed electrically safe fixed fog nozzles shall be provided at locations where high-voltage shock hazards exist. All hose nozzles shall have shutoff capability and be able to control water flow from full open to full closed.	C	Drawing DC07810-036 Nozzle Pressure at Hose Reels	The hose nozzles at the station are designed for electrical hazard service (UL Listed), and are provided with shutoff capability, including the ability to control water flow from full open to a full closed position.
3.6.4	Provisions shall be made to supply water at least to standpipes and hose stations for manual fire suppression in all areas containing systems and components needed to perform the nuclear safety functions in the event of a safe shutdown earthquake (SSE).	C CE	Drawing 302-231 Series TR0780E-005 "Fire Suppression: Standpipe and Hose Stations" Rev 0	The water supply and distribution system, supplies water to including fire hydrants, standpipes and hose stations which are installed to support manual fire fighting operations in all areas containing systems or components needed to perform nuclear safety functions. The standpipe and water distribution piping is not a seismically analyzed system nor a Class III system, which was consistent with NRC Branch Technical Position (BTP) APCSB 9.5-1 Appendix A, that was applicable to VCSNS (plants docketed prior to July 1, 1976). Appendix A modified the requirements for hose standpipe systems and did not discuss class of service, and deleted the seismic design requirement.

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Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
	Exception: For existing plants that are not capable of meeting this requirement, provisions to restore a water supply and distribution system for manual fire-fighting purposes shall be made. This provisional manual fire-fighting standpipe/hose station system shall be capable of providing manual fire-fighting protection to the various plant locations important to supporting and maintaining the nuclear safety function. The provisions for establishing this provisional system shall be preplanned and be capable of being implemented in a timely manner following an SSE.	C	EPP-027 "Hostile Action", Rev 4B	Isolation and restoration plans are available for beyond design basis events for the re-establishment of fire service water distribution system. **THIS EXCEPTION OF THE REQUIREMENT IS NOT ENDORSED BY THE NRC.**
3.6.5	Where the seismic required hose stations are cross-connected to essential seismic non-fire protection water supply systems, the fire flow shall not degrade the essential water system requirement.	NRR		There are no "seismic required" hose stations at VCSNS. Therefore degradation of the supply as discussed in section 3.6.5 is not a present design consideration.
3.7	**Fire Extinguishers**			
	Where provided, fire extinguishers of the appropriate number, size, and type shall be provided in accordance with NFPA 10, Standard for Portable Fire Extinguishers. Extinguishers shall be permitted to be positioned outside of fire areas due to radiological conditions.	CE	Station Fire Preplans, DC0780A-010 "Fire Extinguisher Layout", Rev 0 DC0780D-005 "Manual Suppression", Rev 0	Fire extinguisher selection and layout are in accordance with NFPA 10. The fire extinguishers have been evaluated against the requirements of NFPA10, "Standard for Portable Fire Extinguishers"
3.8	**Fire Alarm and Detection Systems**			
3.8.1	**Fire Alarm**			

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Section	Section Description	Disposition	Reference Document	Results Summary
	Alarm initiating devices shall be installed in accordance with NFPA 72, National Fire Alarm Code®. Alarm annunciation shall allow the proprietary alarm system to transmit fire-related alarms, supervisory signals, and trouble signals to the control room or other constantly attended location from which required notifications and response can be initiated. Personnel assigned to the proprietary alarm station shall be permitted to have other duties. The following fire-related signals shall be transmitted:	C CE	Drawings 228-044 Series Vendor Manual 1MS-94B-1334 "Simplex: Fire Alarm 4100 Panel" Vendor Manual 1MS-94B-1335 "Simplex: Fire Alarm 2120 Panel" EPP-013 "Fire Emergency", Rev 8 DC0780D-005 "Fire Alarm and Detection Systems", Rev 0	Fire Alarm and Control System, which includes the alarm initiating devices is designed as a proprietary alarm system such that system alarms, supervisory signals and trouble signals are transmitted to the Control Room, to support timely response by station personnel. The Fire Detection and Control system has been evaluated against the requirements of NFPA 72 "National Fire Alarm Code"
	(1) Actuation of any fire detection device	C	Vendor Manual 1MS-94B-1334 "Simplex: Fire Alarm 4100 Panel" Vendor Manual 1MS-94B-1335 "Simplex: Fire Alarm 2120 Panel" Drawings 228-044 Series "Fire Service Interconnection and Block Diagrams" SP-0928 "Fire Detection & Control System", Rev 0	Actuation of any detection device is alarmed in the control room.
	(2) Actuation of any fixed fire suppression system	C	Vendor Manual 1MS-94B-1334 "Simplex: Fire Alarm 4100 Panel" Vendor Manual 1MS-94B-1335 "Simplex: Fire Alarm 2120 Panel" Drawings 228-044 Series "Fire Service Interconnection and Block Diagrams" SP-0928 "Fire Detection & Control System", Rev 0	Actuation of any fixed suppression is alarmed in the control room.

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Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
	(3) Actuation of any manual fire alarm station	C	Vendor Manual 1MS-94B-1334 "Simplex: Fire Alarm 4100 Panel" Vendor Manual 1MS-94B-1335 "Simplex: Fire Alarm 2120 Panel" Drawings 228-044 Series "Fire Service Interconnection and Block Diagrams" SP-0928 "Fire Detection & Control System", Rev 0	Actuation of any manual fire alarm station is alarmed in the control room.
	(4) Starting of any fire pump	C	Vendor Manual 1MS-94B-1334 "Simplex: Fire Alarm 4100 Panel" Vendor Manual 1MS-94B-1335 "Simplex: Fire Alarm 2120 Panel" Drawings 228-044 Series "Fire Service Interconnection and Block Diagrams" SP-0928 "Fire Detection & Control System", Rev 0	Starting of any fire pump is alarmed in the control room.
	(5) Actuation of any fire protection supervisory device	C	Vendor Manual 1MS-94B-1334 "Simplex: Fire Alarm 4100 Panel" Vendor Manual 1MS-94B-1335 "Simplex: Fire Alarm 2120 Panel" Drawings 228-044 Series "Fire Service Interconnection and Block Diagrams" SP-0928 "Fire Detection & Control System", Rev 0	Actuation of any fire protection supervisory device is alarmed in the control room.

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Section	Section Description	Disposition	Reference Document	Results Summary
	(6) Indication of alarm system trouble condition	C	Vendor Manual 1MS-94B-1334 "Simplex: Fire Alarm 4100 Panel" Vendor Manual 1MS-94B-1335 "Simplex: Fire Alarm 2120 Panel" Drawings 228-044 Series "Fire Service Interconnection and Block Diagrams" SP-0928 "Fire Detection & Control System", Rev 0	Alarm system trouble condition is alarmed in the control room.
3.8.1.1	Means shall be provided to allow a person observing a fire at any location in the plant to quickly and reliably communicate to the control room or other suitable constantly attended location.	C	EPP-013 "Fire Emergency", Rev 8	The plant page and station telephone systems are the most common means for reporting a fire to the control room, from any location in the plant.
3.8.1.2	Means shall be provided to promptly notify the following of any fire emergency in such a way as to allow them to determine an appropriate course of action: (1) General site population in all occupied areas; (2) Members of the industrial fire brigade and other groups supporting fire emergency response; (3) Off-site fire emergency response agencies. Two independent means shall be available (e.g., telephone and radio) for notification of off-site emergency services.	C	EPP-013 "Fire Emergency", Rev 8	The Page Party System is used as the primary means to notify the General Site population and fire brigade members of the appropriate course of action in the event of a fire emergency. Communications with Off-Site agencies may be made by Land line telephone and radio system.
3.8.2	**Detection**			

Section	Section Description	Disposition	Reference Document	Results Summary
	If automatic fire detection is required to meet the performance or deterministic requirements of Chapter 4, then these devices shall be installed in accordance with NFPA 72, National Fire Alarm Code, and its applicable appendixes.	CE	SP-0928 "Fire Detection & Control System", Rev 0 DC0780D-005 "Fire Alarm and Detection System", Rev 0	The fire alarm and detection system was installed in accordance with NFPA 72, as described in NFPA 805, section 3.8.1. Automatic fire detectors were designed and installed in accordance with NFPA 72E. The Fire Detection devices has been evaluated against the requirements of NFPA 72E "Standard for Automatic Fire Detectors" [Code of Record for original installation] (Table S-2, Item 10)
3.9	**Automatic and Manual Water-Based Fire Suppression System**			
3.9.1*	If an automatic or manual water-based fire suppression system is required to meet the performance or deterministic requirements of Chapter 4, then the system shall be installed in accordance with the appropriate NFPA standards including the following:	NRR		Individual elements are addressed in the following sections
	(1) NFPA 13, Standard for the Installation of Sprinkler Systems	CE	DC0780D-003 Automatic Fire Suppression: NFPA 13	Sprinkler Systems are designed and installed in accordance with NFPA 13. The "Required" sprinkler systems have been evaluated against the requirements of NFPA 13, "Standard for the Installation of Sprinkler Systems"
	(2) NFPA 15, Standard for Water Spray Fixed Systems for Fire Protection	NRR	NA	"Required" water spray systems that have not been identified as being credited for the NSCA or FirePRA Analysis.
	(3) NFPA 750, Standard on Water Mist Fire Protection Systems	NRR	NA	VCSNS does not utilize Water Mist Fire Protection Systems.
	(4) NFPA 16, Standard for the Installation of Foam-Water Sprinkler and Foam-Water Spray Systems	NRR	NA	VCSNS does not utilize Foam Water Fire Protection Systems.

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Section	Section Description	Disposition	Reference Document	Results Summary
3.9.2	Each system shall be equipped with a water flow alarm.	C	Drawings 302-231 Series SP-0928 Fire Detection & Control System, Rev 0	Each fire suppression system is equipped with a water flow alarm, which alarms to the Control Room.
3.9.3	All alarms from fire suppression systems shall communicate in the control room or other suitable constantly attended.	C	Vendor Manual 1MS-94B-1334 "Simplex: Fire Alarm 4100 Panel" Vendor Manual 1MS-94B-1335 "Simplex: Fire Alarm 2120 Panel" Drawings 228-044 Series Fire Service Interconnection and Block Diagrams, SP-0928"Fire Detection & Control System", Rev 0	For water based systems, the fire alarm and control system monitors and controls the transmission of water flow alarms to the Control Room.
3.9.4	Diesel-driven fire pumps shall be protected by automatic sprinklers.	C	Drawing 1MS-55-085-0026, "Diesel Fire Pump Room Sprinkler"	The Diesel engine driven fire pump room is protected by an automatic sprinkler system.
3.9.5	Each system shall be equipped with an OS&Y gate valve or other approved shutoff valve.	C	Drawings 302-231 Series	Each suppression system is equipped with an OS&Y isolation valve.
3.9.6	All valves controlling water-based fire suppression systems required to meet the performance or deterministic requirements of Chapter 4 shall be supervised as described in 3.5.14.	C	See Section 3.5.14	Valves are normally sealed in the normal operating position. See Section 3.5.14
3.10	**Gaseous Suppression Systems**			
3.10.1	If an automatic total flooding and local application gaseous fire suppression system is required to meet the performance or deterministic requirements of Chapter 4, then the system shall be designed and installed in accordance with the following applicable NFPA codes:	NRR		Individual elements are addressed in the following sections

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
	(1) NFPA 12, Standard on Carbon Dioxide Extinguishing Systems	CE	DC0780D-003 Automatic Fire Suppression	Low Pressure Carbon Dioxide Systems are designed and installed in accordance with NFPA 12. The "Required" carbon dioxide system has been evaluated against the requirements of NFPA 12, "Standard on Carbon Dioxide Extinguishing Systems
	(2) NFPA 12A, Standard on Halon 1301 Fire Extinguishing Systems	NRR	NA	"Required" Halon 1301 systems have not been identified as being credited for the NSCA or FirePRA Analysis.
	(3) NFPA 2001, Standard on Clean Agent Fire Extinguishing Systems	NRR	NA	VCSNS does not utilize Clean Agent Fire Extinguishing Systems.
3.10.2	Operation of gaseous fire suppression systems shall annunciate and alarm in the control room or other constantly attended location identified.	C	SP-0928 "Fire Detection & Control System" Vendor Manual 1MS-94B-1334 "Simplex: Fire Alarm 4100 Panel" Vendor Manual 1MS-94B-1335 "Simplex: Fire Alarm 2120 Panel" Drawings 228-044 Series Fire Service Interconnection and Block Diagrams,	Gaseous fire suppression systems alarms are monitored by the fire alarm and control system, which annunciates this condition to the Control Room.
3.10.3	Ventilation system design shall take into account prevention from over pressurization during agent injection, adequate sealing to prevent loss of agent, and confinement of radioactive contaminants.	C	VCSNS DBD "Fire Protection System" (FS), Rev 2E Section 3.4.4 Chemtron Ltr dated, 3/8/82, Field Test Report Job# FL 22425-3	Functional testing addressed loss of agent via discharge testing. No indications of over pressurization were evident in system files. The CO2 system(s) are not installed in radiological areas of the plant.
3.10.4*	In any area required to be protected by both primary and backup gaseous fire suppression systems, a single active failure or a crack in any pipe in the fire suppression system shall not impair both the primary and backup fire suppression capability.	NRR	NA	There are no installed backup gaseous fire suppression systems utilized at VCSNS.

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
3.10.5	Provisions for locally disarming automatic gaseous suppression systems shall be secured and under strict administrative control.	C	SAP-201 "Equipment Tagging and Lockout -Tag Out", Rev 11C FS DBD "Fire Protection", Rev 2E Drawing 302-232 "P&ID: FS Halon and Low Pressure CO2", Rev 5	The disarmed status of the CO2 system is annunciated in the Control Room to assure that the system is returned to its operating (armed) status when the area is no longer occupied. Positive system status control is maintained by Control Room personnel for this system.
3.10.6*	Total flooding carbon dioxide systems shall not be used in normally occupied areas.	C	Field Walkdown	CO2 systems in CB06, CB07 & CB09 are not located in areas normally inhabited by station personnel, do not have permanent work stations, are not normally utilized as an occupied area, and are not a normal personnel pass through area.
3.10.7	Automatic total flooding carbon dioxide systems shall be equipped with an audible pre-discharge alarm and discharge delay sufficient to permit egress of personnel. The carbon dioxide system shall be provided with an odorizer.	C	SP-117 "Plant Fire Protection System" Drawing 302-233 "Halon and Low Pressure CO2", Rev 5	Pre-discharge alarms, time delays and odorizers are provided personnel protection for total flooding CO_2 protected areas.
3.10.8	Positive mechanical means shall be provided to lock out total flooding carbon dioxide systems during work in the protected space.	C	SAP-201 "Equipment Tagging and Lockout -Tag Out", Rev 11C FS DBD "Fire Protection", Rev 2E Drawing 302-232 "P&ID: FS Halon and Low Pressure CO2", Rev 5	Isolation valves are provided as a mechanical means to isolate the CO2 system(s).
3.10.9	The possibility of secondary thermal shock (cooling) damage shall be considered during the design of any gaseous fire suppression system, but particularly with carbon dioxide.	CE	Field Walkdown TR0780E-005 "Fire Suppression: CO2 Thermal Shock", Rev 0	The placement of discharge nozzles to sensitive electrical equipment was considered during design. Nozzle positions were reviewed for possible impacts.

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
3.10.10	Particular attention shall be given to corrosive characteristics of agent decomposition products on safety systems.	C	SP-117 "Plant Fire Protection System"	An odorless gas, which is non conductive, carbon dioxide [CO2] is widely distributed in nature and is a minor component of air. It is highly soluble in water and oil. The presence of CO2 in water can create a weak acid, however the agent is not normally present in the protected area. The CO2 system should extinguish a fire prior to application of water from fire hoses. However, post fire cleanup, depending on extent of fire damage shall consider potential impact of decomposition products on safety systems.
3.11	**Passive Fire Protection Features**			
	This section shall be used to determine the design and installation requirements for passive protection features. Passive fire protection features include wall, ceiling, and floor assemblies, fire doors, fire dampers, and through fire barrier penetration seals. Passive fire protection features also include electrical raceway fire barrier systems (ERFBS) that are provided to protect cables and electrical components and equipment from the effects of fire.	NRR		Individual elements are addressed in the following sections
3.11.1	**Building Separation**			
	Each major building within the power block shall be separated from the others by barriers having a designated fire resistance rating of 3 hours or by open space of at least 50 ft (15.2 m) or space that meets the requirements of NFPA 80A, "Recommended Practice for Protection of Buildings from Exterior Fire Exposures."	C	Drawings E023 Series	Major buildings within the power block are separated by 3 hour construction.

Section	Section Description	Disposition	Reference Document	Results Summary
	Exception: Where a performance-based analysis determines the adequacy of building separation, the requirements of 3.11.1 shall not apply.	NRR		
3.11.2	**Fire Barriers**			
	Fire barriers required by Chapter 4 shall include a specific fire resistance rating. Fire barriers shall be designed and installed to meet the specific fire resistance rating using assemblies qualified by fire tests. The qualification fire tests shall be in accordance with NFPA 251, Standard Methods of Tests of Fire Endurance of Building Construction and Materials, or ASTM E 119, Standard Test Methods for Fire Tests of Building Construction and Materials.	CE	TR0780E-006 "Fire Protection Features: Fire Barriers" , Rev 0	The fire barriers have been designed or evaluated to satisfy the performance requirements of Chapter 4. Where applicable, references to standard qualification tests have been included in evaluations. Equivalency provided to describe overall fire barriers construction details has been documented in selected cases to support equivalent performance to tested configurations. (Table S-2, Item 11)
3.11.3*	**Fire Barrier Penetrations**			
3.11.3	Penetrations in fire barriers shall be provided with listed fire-rated door assemblies or listed rated fire dampers having a fire resistance rating consistent with the designated fire resistance rating of the barrier as determined by the performance requirements established by Chapter 4. (See 3.11.4 for penetration seals for through penetration fire stops.) Passive fire protection devices such as doors and dampers shall conform with the following NFPA standards, as applicable:	CE	DC0780D-007 Passive Fire Protection Features, Rev 0	Fire Doors and Dampers are evaluated in openings to ensure the rating of the penetrated fire barrier. (Table S-2, Item 11)

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
	(1) NFPA 80, Standard for Fire Doors and Fire Windows	CE CNRC	DC0780D-007 Passive Fire Protection Features, Rev 0 TR0787E-006 "Fire Protection Features: Specialty Fire Doors", Rev 0	The fire door design has been evaluated against the requirements of NFPA 80 "Standard for Fire Doors and Windows". Prior NRC approval of specialty doors (e.g. pressure and bullet resistant) were previously found to be acceptable and has been summarized in the defined evaluation
	(2) NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems	CE CNRC	DC0780D-007 Passive Fire Protection Features, Rev 0 TR0787E-006 "Fire Protection Features: Fire Dampers, Back to Back", Rev 0	The fire damper design has been evaluated against the requirements of NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems". Prior NRC approval of unique damper configurations were previously found to be acceptable and has been summarized in the defined evaluation
	(3) NFPA 101, Life Safety Code	NRR		NFPA101 is exempted from the scope of the NRC review per 10 CFR 50.48 C.2 (i) regarding Life Safety. The requirements related to fire doors /fire dampers are addressed in the NFPA 80 and NFPA 90A code compliance reviews.
	Exception: Where fire area boundaries are not wall-to-wall, floor-to-ceiling boundaries with all penetrations sealed to the fire rating required of the boundaries, a performance-based analysis shall be required to assess the adequacy of fire barrier forming the fire boundary to determine if the barrier will withstand the fire effects of the hazards in the area. Openings in fire barriers shall be permitted to be protected by other means as acceptable to the AHJ.	C	TR0780E-001 "NSCA Separation", Rev 0 TR07870-001 "Fire Rated Seals", Rev 0 DC0780C Series Calculations " Multicompartment Analysis"	Fire rated boundaries, when identified have openings which are protected as described in 3.11.3. In cases where boundaries were credited where the boundary was not wall to wall or floor to ceiling, with all opening protected, a performance based analysis has been performed to assess the adequacy of the fire barrier forming the fire boundary

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
3.11.4*	**Through Penetration Fire Stops**			
	Through penetration fire stops for penetrations such as pipes, conduits, bus ducts, cables, wires, pneumatic tubes and ducts, and similar building service equipment that pass through fire barriers shall be protected as follows:	C CE	TR07870-002 "Penetration Seals Engineering Evaluations", Rev 0	Penetration seals through rated fire barriers are qualified by test or evaluated to maintain the rating of the penetrated fire barrier. (Table S-2, Item 12)
	(a) The annular space between the penetrating item and the through opening in the fire barrier shall be filled with a qualified fire-resistive penetration seal assembly capable of maintaining the fire resistance of the fire barrier. The assembly shall be qualified by tests in accordance with a fire test protocol acceptable to the AHJ or be protected by a listed fire-rated device for the specified fire-resistive period.	C CE	TR07870-002 "Penetration Seals Engineering Evaluations", Rev 0	Penetration seals through rated fire barriers are qualified by test or evaluated to maintain the rating of the penetrated fire barrier. (Table S-2, Item 11)
	(b) Conduits shall be provided with an internal fire seal that has an equivalent fire-resistive rating to that of the fire barrier through opening fire stop and shall be permitted to be installed on either side of the barrier in a location that is as close to the barrier as possible.	C	Drawing 201-240, Sheet 2 "Fire, Pressure and Radiation Barrier Details", Rev 11	Internal conduit penetration seals are closed with internal fire seals to maintain the rating of the barrier.
	Exception: Openings inside conduit 4 in. (10.2 cm) or less in diameter shall be sealed at the fire barrier with a fire-rated internal seal unless the conduit extends greater than 5 ft (1.5 m) on each side of the fire barrier. In this case the conduit opening shall be provided with noncombustible material to prevent the passage of smoke and hot gases. The fill depth of the material packed to a depth of 2 in. (5.1 cm) shall constitute an acceptable smoke	C	Drawing 201-240, Sheet 2 "Fire, Pressure and Radiation Barrier Details", Rev 11	Internal conduit penetration seals are closed with internal fire seals to maintain the rating of the barrier as described in the **Exception**.

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
	and hot gas seal in this application.			
3.11.5*	**Electrical Raceway Fire Barrier Systems (ERFBS)**			
	ERFBS required by Chapter 4 shall be capable of resisting the fire effects of the hazards in the area. ERFBS shall be tested in accordance with and shall meet the acceptance criteria of NRC Generic Letter 86-10, Supplement 1, "Fire Endurance Test Acceptance Criteria for Fire Barrier Systems Used to Separate Safe Shutdown Trains Within the Same Fire Area." The ERFBS needs to adequately address the design requirements and limitations of supports and intervening items and their impact on the fire barrier system rating. The fire barrier system's ability to maintain the required nuclear safety circuits free of fire damage for a specific thermal exposure, barrier design, raceway size and type, cable size, fill, and type shall be demonstrated.	C CE	TR07870-001 "Kaowool Triple Wrap Raceway Fire Barrier Test for Conduits and Cable Tray", Rev 0 TR07870-017 "Evaluation of Interam E-54A Fire Wrap" Rev 0 DC07870-003 "Kaowool Thermal Mass Comparison of Test vs. Plant" Rev 0 TR0780E-006 "Fire Protection Features: ERFBS", Rev 0	"Required" ERFBS are installed to provide 1-hour or 3-hour fire barrier rating. Qualification testing has been performed in accordance with Generic Letter 86-10, Supplement 1 or equivalent performance testing to ensure the protected raceways are free of fire damage. (Table S-2, Item 11) A summary of ERFBS testing and systems employed at the station has been included in the engineering evaluation.
	Exception No. 1: When the temperatures inside the fire barrier system exceed the maximum temperature allowed by the acceptance criteria of Generic Letter 86-10, "Fire Endurance Acceptance Test Criteria for Fire Barrier Systems Used to Separate Redundant Safe Shutdown Training Within the Same Fire Area," Supplement 1, functionality of the cable at these elevated temperatures shall be demonstrated. Qualification demonstration of these cables shall be performed in accordance with the electrical testing requirements of Generic Letter 86-10, Supplement 1, Attachment 1, "Attachment	C	TR07870-001 "KaowoolTriple Wrap Raceway Fire Barrier Test for Conduits and Cable Tray", Rev 0 TR07870-017 "Evaluation of Interam E-54A Fire Wrap" Rev 0 DC07870-003 "Kaowool Thermal Mass Comparison of Test vs. Plant" Rev 0	Guidance concerning cable functionality may be used, as appropriate, in the evaluation of performance of ERFBS, via electrical testing requirements of Generic Letter 86-10, Supplement 1, Attachment 1.

NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements				
Section	**Section Description**	**Disposition**	**Reference Document**	**Results Summary**
	Methods for Demonstrating Functionality of Cables Protected by Raceway Fire Barrier Systems During and After Fire Endurance Test Exposure."			
	Exception No. 2: ERFBS systems employed prior to the issuance of Generic Letter 86-10, Supplement 1, are acceptable providing that the system successfully met the limiting end point temperature requirements as *specified by the AHJ at the time of* acceptance.	NRR		ERFBS systems have been evaluated after the issuance of Generic Letter 86-10, Supplement 1.

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

40 Pages Attached

NFPA 805 Section ***2.4.2 Nuclear Safety Capability Assessment***

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 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 occasion of nuclear safety equipment and cables
(4) Assessment of the ability to achieve the nuclear safety performance criteria given in each fire area.

Steps 1 through 4 shall be performed to determined equipment and cables that shall be evaluated using either the deterministic or performance-based method in Chapter 4. Other performance-based or risk-informed methods acceptable to authority having jurisdiction (AHJ) shall be permitted.

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
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.	Introductory section, alignment identified in subsections	

NFPA 805 Section ***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 of result in the maloperation of those components needed to meet the nuclear the safety criteria shall be included. Availability and reliability of equipment selected shall be evaluated. (See Appendix B for acceptable methods used to identify equipment)

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
3.1 [A, Intro] Safe Shutdown Systems and Path Development	This section discusses the identification of systems available and 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. It is expected that the term "free of fire damage" will be further clarified in a forthcoming Regulatory Issue Summary. 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. It is the intent of the NRC that requirements related to the use of manual operator actions will be addressed in a forthcoming rulemaking.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
3.1 [B, Goals] Safe Shutdown Systems and Path Development	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 important 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 important to 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; - Support systems;- Electrical systems; - Cooling 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.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
3.1 [C, Spurious Operations] Safe Shutdown Systems and Path Development	In addition to the above listed functions, Generic Letter 81-12 specifies consideration of associated circuits with the potential for spurious equipment operation and/or loss of power source, and the common enclosure failures. Spurious operations/actuations can affect the accomplishment of the post-fire 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. Common power source and common enclosure concerns could also affect these and must be addressed.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
3.1.1 Criteria/Assumptions	The following criteria and assumptions may be considered when identifying systems available and necessary to perform the required safe shutdown functions and combining these systems into safe shutdown paths.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015

NFPA 805 Section ***2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection***

3.1.1.01 [BWR Safe Shutdown Paths]	[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.	Not Applicable	
3.1.1.02 [BWR Safety Relief Valves/Low Pressure Systems]	[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 10CFR50 Appendix R Sections III.G.1 and III.G.2. The NRC has accepted the BWROG position and issued a SER dated Dec. 12, 2000.	Not Applicable	
3.1.1.03 [PWR, 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.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
3.1.1.04 [Alternative Shutdown Capability]	The classification of shutdown capability as alternative shutdown is made independent of the selection of systems used for shutdown. Alternative 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 manual actions to the extent allowed by the regulations and the licensing basis of the plant, repairs (cold shutdown only), exemptions, deviations, GL 86-10 fire hazards analyses or fire protection design change evaluations, as appropriate. These may also be used in conjunction with alternative shutdown capability.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312
3.1.1.05 [Initial Conditions]	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.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312
3.1.1.06 [Other Events in Conjunction with Fire]	No Final Safety Analysis Report accidents or other design basis events (e.g. loss of coolant accident, earthquake), single failures or non-fire induced transients need be considered in conjunction with the fire.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312
3.1.1.07 [Availability of Offsite Power]	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.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312

NFPA 805 Section ***2.4.2.1 Nuclear Safety Capability Systems and Equipment Selection***

3.1.1.08 [Safety-Related Equipment]	Post-fire safe shutdown systems and components are not required to be safety-related.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
3.1.1.09 [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.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312
3.1.1.10 [Manual/Automatic 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; automatic initiation of systems selected for safe shutdown is not required but may be included as an option.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312
3.1.1.11 [Multiple Affected Units]	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.	Not Applicable	

NFPA 805 Section ***2.4.2.1 Appendix B.1 Nuclear Safety Assessment***

The primary purpose of the nuclear safety assessment is to demonstrate that given cable and equipment damage due to a fire postulated in any fire area, sufficient equipment remains available to achieve the following nuclear safety performance criteria (see Section 1.5):

(1) Reactivity control
(2) Inventory and pressure control
(3) Decay heat removal
(4) Vital auxiliaries
(5) Process monitoring

The purpose of this appendix is to identify attributes that should be considered when demonstrating this capability. Other risk informed–performance-based methods acceptable to the AHJ are permitted.

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
3.1.2 Shutdown Functions	The following discussion on each of these shutdown functions provides guidance for selecting the systems and equipment required for safe 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."	Introductory section, alignment identified in subsections	
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. [PWR] Makeup/Charging. There must be a method for ensuring that adequate shutdown margin is maintained by ensuring borated water is utilized for RCS makeup/charging.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
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). The SRVs 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 Automatic Depressurization System is not a required function. [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.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015

3.1.2.3 Inventory Control Systems	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.[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.[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.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
3.1.2.4 Decay Heat Removal Systems	[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.[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 does not restrict the use of other systems.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
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 (10CFR50 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 shutdown (III.G.3). IN 84-09 did not identify specific instruments for process monitoring to be applied to redundant shutdown (III.G.1and III.G.2). 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.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015

3.1.2.6 Support Systems 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 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 125 VDC distribution panels may also supply power to the 120VAC distribution panels via static inverters. These distribution panels typically 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 125 VDC distribution system can be powered from the diesels through the battery chargers. 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).	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
3.1.2.6.2 [A, HVAC Systems]	HVAC Systems - 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 may be required to support safe shutdown system operation, based on plant-specific configurations. Typical 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 are essential to safe shutdown equipment operation.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
3.1.2.6.2 [B, Cooling Systems]	Various cooling water systems may be required to support safe shutdown system operation, based on plant-specific considerations. Typical uses include: · Diesel generator cooling; · RHR/SDC/DH Heat Exchanger cooling water, - Safe shutdown pump cooling (seal coolers, oil coolers); · HVAC system cooling water	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015

NFPA 805 Section **_2.4.2.1 Appendix B.2 Nuclear Safety Systems and Equipment_**

A list of systems and equipment that ensure the nuclear safety performance criteria can be achieved during and after a plant fire, regardless of fire location, should be developed. This process can be iterative and can require revisions to incorporate fire risk significant systems and equipment, if further analysis in the circuit analysis or fire area assessment determine additional systems or equipment to be fire risk significant. The process that follows describes the initial attempt to determine which systems and equipment require evaluation. Other risk informed–performance-based methods acceptable to the AHJ can be used to refine the list of nuclear safety systems and equipment. The set of systems and equipment to be considered for nuclear safety should address, as a minimum, the following:.

(a) Systems and equipment required to place the plant in a safe and stable condition following a fire occurring while the plant is at power, or while maintaining hot standby or hot shutdown. This fire also could result in a loss of off-site power, which would require achieving safe and stable conditions using power from on-site ac sources (i.e., emergency diesel generators). This is typically a traditional Appendix R to 10 CFR 50 post-fire safe shutdown analysis.

(b) Systems and equipment required to maintain shutdown cooling capability following a fire originating while the plant is in the shutdown cooling mode.

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
3.1.3 Methodology for Shutdown System Selection	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: [Refer to hard copy of NEI 00-01 for Figure 3-2]	Introductory section, alignment identified in subsections	
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)	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
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 spurious operations and power supply issues that could impact the required safe shutdown function.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
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.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312
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 of NEI 00-01 for an example of a table illustrating how to document the various combinations of systems for selected shutdown paths.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312

NFPA 805 Section ***2.4.2.1 Appendix B.2 Nuclear Safety Systems and Equipment***

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 function. 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 maloperation of the safe shutdown systems.	Introductory section, alignment identified in subsections

NFPA 805 Section **_2.4.2.1 Appendix B.2.1 Assumptions (Plant Conditions at Time of Postulated Fire)_**

In addition to the assumptions in Chapter 2, the following assumptions apply to this appendix.

(a) The plant is in a standard lineup governed by operating procedures, operating modes, or administrative controls at the onset of the fire.

(b) Properly oriented check valves function to prevent reverse flow in process systems.

(c) Normally closed manual valves (hand-operated only) will remain undamaged by a fire and can be relied upon for system boundary isolation.

(d) Instruments located in a fire affected area (e.g., RTDs, thermocouples, pressure transmitters, flow transmitters, and mechanically linked remote/local indications) are assumed to be damaged unless it can be demonstrated otherwise. The instrument fluid boundary associated with these devices, with the exception of soldered fittings, is assumed to remain intact.

(e) Piping, check valves, strainers, tanks, manual valves, heat exchangers, safety relief valves, and pressure vessels are assumed to remain functional during and after a fire. The integrity of instrument tubing, with the exception of soldered fittings, is also expected to be maintained, though the accuracy of the instrument reading can be affected due to heating of the process fluid.

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
3.2.1 Criteria/Assumptions	Consider the following criteria and assumptions when identifying equipment necessary to perform the required safe shutdown functions:	Introductory section, alignment identified in subsections	
3.2.1.1 [A, Primary Components]	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.).	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
3.2.1.1 [B, Secondary Components]	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. 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.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015

NFPA 805 Section ***2.4.2.1 Appendix B.2.1 Assumptions (Plant Conditions at Time of Postulated Fire)***

3.2.1.2 [Fire Damage to Mechanical Components]	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.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
3.2.1.3 [Manual Valve Positions]	Assume that manual valves are in their normal position as shown on P&IDs or in the plant operating procedures.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
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.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
3.2.1.5 [Instrument Failures]	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.	Aligns	See Circuit Analysis Procedure PI 4.4 Appendix F and Technical Report TR07800-009
3.2.1.6 [Spurious Components]	Identify equipment that could spuriously operate or mal-operate and impact the performance of equipment on a required safe shutdown path during the equipment selection phase. Consider Bin 1 of RIS 2004-03 during the equipment identification process.	Aligns	See Nuclear Safety Equipment Report TR08620-015 and Circuit Analysis TR07800-009.
3.2.1.7 [Instrument Tubing]	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.	Aligns	Technical Report TR08620-019. See ARC software model for impacts.

NFPA 805 Section ***2.4.2.1 Appendix B.2.2 [Step 2, System Interrelationships]***

Step 2: System Interrelationships.

The selection of systems and the documentation of how these systems fulfill the nuclear safety performance criteria should be depicted in system-level logic diagrams, fault trees, or some other method that shows equipment dependencies. The documentation should consider not only the required process systems but also the essential mechanical/environmental support and essential electrical systems required to support the nuclear safety performance criteria.

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
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.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312

NFPA 805 Section ***2.4.2.1 Appendix B.2.2 [Step 3(a), Equipment Identification]***

Step 3: Equipment Identification.

(a) P&IDs (piping and instrumentation diagrams)/flow diagrams should be used to identify the equipment in the flowpath and the boundary equipment within the systems that are required to achieve the nuclear safety objectives.

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
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. [Refer to hard copy of NEI 00-01 for Attachment A]	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015

NFPA 805 Section *2.4.2.1 Appendix B.2.2 [Step 3(b), Diversion Equipment]*

(b) Equipment that is not directly in a required system flowpath but whose spurious operation (undesired operation) could prevent achieving the nuclear safety objectives should be identified (e.g., boundary valve component whose spurious opening could divert flow away from critical equipment). The potential for spurious operations of equipment should be considered when determining boundary valves and equipment selection. Loops or bypasses within a system where spurious operation would not result in a loss of flow or inadequate flow to nuclear safety success paths need not be considered. For tanks, all outlet lines should be considered for their functional requirements. For lines not required to be functional, a means of isolation should be included when necessary to prevent unnecessary drawdown of the tank. Tank fill lines should also be considered. For example, if two normally closed valves in series must spuriously open to result in an unrecoverable condition, then both valves should be identified on the nuclear safety equipment list (NSEL). If positive means is provided to preclude spurious operation of one valve/component for non-high-low pressure interface component [such as removing power to one of the two motor-operated valves (MOVs) during normal operation], then consideration of the additional component (the other series valve) is not required.

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
3.2.2.2 Identify the Equipment in Each Safe Shutdown System Flow PathIncluding Equipment That May Spuriously Operate and Affect SystemOperation	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. If additional systems are identified which are necessary for the operation of the safe shutdown system under review, include these as systems required for safe shutdown. Designate these new systems with the same safe shutdown path as the primary safe shutdown system under review (Refer to Figure 3-1). [Refer to hard copy of NEI 00-01 for Figure 3-1]	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015

NFPA 805 Section ***2.4.2.1 Appendix B.2.2 [Step 3(c), Fire-Induced Plant Transients]***

(c) Careful consideration should be given to equipment that could result in a fire-induced plant transient. The following is guidance on considerations that should be given in the identification of equipment that could result in a fire-induced plant transient.

(1) Fire-induced plant initiating events [transients and loss of coolant accidents (LOCAs)].

Transients are defined as anticipated operational occurrences (e.g., inadvertent safety injection actuation, loss of off-site power, overcooling, overfilling of steam generators, spurious closure of containment isolation valves, significant loss of safety systems, station blackout, rapid cooldown, etc.) that initiate as a result of fire-induced circuit failures.

a. Loss of primary system inventory. The potential for fire initiated spurious actuation at reactor coolant pressure boundaries that could cause an uncontrolled loss of reactor coolant inventory [e.g., spurious actuation of primary coolant interfaces such as at the reactor head vents, normal and excess letdown at a pressurized water reactor (PWR), main steam relief valves (BWRs)] should be considered.

b. Rapid cooldown. Transients that could result in an uncontrolled plant cooldown due to spurious operatioof boundary valves should be considered. Interaction of plant systems such as steam generator (PWR) atmospheric dump valves, power-operated relief valves, safety relief valves (BWR) feedwater, reactor trip, turbine trip, and main steam isolation should be considered as well.

c. Uncontrolled primary injection. Transients that could potentially result in an undesired or uncontrolled injection into the reactor coolant system should be assessed. This can include spurious actuation of high-pressure injection sources (i.e., HPCS, RCIC, HPCI, feedwater for BWRs, high-head ECCS pumps for PWRs).

d. Electric power transients. Transients that could result in a loss of any ac power supplies should be considered. This loss can include spurious breaker actuations, onsite generating capability spurious starts or failures, or inadvertent paralleling of ac sources due to fire induced circuit failures.

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
3.2.1.6 [Spurious Components]	Identify equipment that could spuriously operate or mal-operate and impact the performance of equipment on a required safe shutdown path during the equipment selection phase. Consider Bin 1 of RIS 2004-03 during the equipment identification process.	Aligns	See Nuclear Safety Equipment Report TR08620-015 and Circuit Analysis TR07800-009.

NFPA 805 Section ***2.4.2.1 Appendix B.2.2 [Step 3(d), Support Systems]***

(d) Equipment that requires support such as cooling water, instrument air, HVAC, motive power, and control power should be considered in order to understand component and system inter-relationships and sequential equipment loss impact.

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
3.2.1.1 [A, Primary Components]	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.).	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015

NFPA 805 Section ***2.4.2.1 Appendix B.2.2 [Step 3(e), Offsite Power]***

(e) Off-site power can be used as a source of power for nuclear safety equipment. All equipment required to support the portion of off-site power relied upon to achieve the nuclear safety performance criteria should also be identified. Off-site power should conservatively be considered available for those cases where availability of off-site power could adversely impact nuclear safety (i.e., reliance cannot be placed on fire causing a loss of off-site power if the consequences of off-site power availability are more severe than its presumed loss). No credit should be taken for a fire causing a loss of offsite power to prevent spurious operations.

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
3.2.1.1 [A, Primary Components]	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.).	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015

NFPA 805 Section **_2.4.2.1 Appendix B.2.2 [Step 3(f), Instrument Sensing Line]_**

(f) Instrument sensing lines should be considered for potential inaccurate instrument indications and/or spurious equipment actuations that could occur as a result of an instrument sensing line being exposed to a fire and increased temperatures. Any instrument sensing lines that could prevent the fulfillment of the nuclear safety performance criteria should be identified, associated with the equipment that it could impact, and included in the nuclear safety assessment for review on a fire area basis.

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
3.2.1.7 [Instrument Tubing]	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.	Aligns	Technical Report TR08620-019. See ARC software model for impacts.

NFPA 805 Section ***2.4.2.1 Appendix B.2.2 [Step 3(g), Instrument Air Piping]***

(g) Instrument air piping and components (e.g., accumulators) should be considered for viability during and after the fire in providing the motive force for credited components

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
3.2.1.2 [Fire Damage to Mechanical Components]	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.	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015

NFPA 805 Section ***2.4.2.1 Appendix B.2.2 [Step 3(h), Power Supplies]***

(h) Power supplies, including alternate power supplies, for nuclear safety equipment should be identified. Interrelationships between power supplies (such as bus-tie capability and alternate power supplies) should also be identified. This information is essential in determining nuclear safety equipment losses due to loss of a power supply

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
3.2.1.1 [A, Primary Components]	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.).	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015

NFPA 805 Section ***2.4.2.1 Appendix B.2.2 [Step 4, Equipment Interrelationships]***

Step 4: Equipment Interrelationships. The necessary relationships between individual nuclear safety equipment and systems should be understood and documented.

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
3.2.1.5 [Instrument Failures]	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.	Aligns	See Circuit Analysis Procedure PI 4.4 Appendix F and Technical Report TR07800-009

NFPA 805 Section ***2.4.2.1 Appendix B.2.2 [Step 5(a), Equipment Selection Documentation]***

Step 5: Documentation.

(a) The bases for selection and exclusion of nuclear safety systems and equipment should be documented and maintained. Calculations and analyses that have been previously performed in support of other nuclear safety objectives (i.e., station blackout, seismic qualification) can be utilized provided the results of these analyses have properly considered the applicability to post-fire nuclear safety.

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
3.2.2.3 Develop a List of Safe Shutdown Equipment and Assign the Corresponding System and Safe Shutdown Path(s) Designation to Each.	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. 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 safe shutdown and it documents various equipment-related attributes used in the analysis. [Refer to hard copy of NEI 00-01 for Attachment 3]	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
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. [Refer to hard copy of NEI 00-01 for Attachment 3]	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015
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. [Refer to hard copy of NEI 00-01 for Attachment 4]	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009

NFPA 805 Section ***2.4.2.1 Appendix B.2.2 Considerations for the Selection of Nuclear Safety Systems and Equipment. [Step 1]***

Step 1: System Identification. Based upon documentation of plant design, risk insights, and operation, plant systems required to achieve each of the nuclear safety criteria should be identified.

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
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: [Refer to hard copy of NEI 00-01 for Figure 3-3]	Aligns	See Nuclear Safety Equipment Technical Report TR08620-015

NFPA 805 Section ***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 maloperation 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.

(See Appendix B for considerations in analyzing circuits.)

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.

(See Appendix B for considerations when analyzing common power supply concerns.)

NEI 00-01 Section	**NEI 00-01 Section Description**	NFPA 805 Alignment	NFPA 805 Reference
3.3 Safe Shutdown Cable Selection and Location	This section provides industry guidance on the recommended methodology and criteria 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 maloperation 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.	Introductory section, alignment identified in subsections	
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:	Introductory section, alignment identified in subsections	

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3.3.1.1 [Cable Selection]	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. Consider reviewing 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. For an example of this see Section 3.3.1.4.	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009
3.3.1.2 [Cables Affecting Multiple Components]	In cases where the failure (including spurious actuations) of a single cable could impact more than one piece of safe shutdown equipment, include the cable with each piece of safe shutdown equipment.	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009
3.3.1.3 [Isolation devices]	Electrical devices such as relays, switches and signal resistor units are considered to be acceptable isolation devices. In the case of instrument loops, 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.	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009
3.3.1.4 [Identify "Not Required" Cables]	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. However, they 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.	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009
3.3.1.5 [Identify Power Supplies]	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. Evaluate the power cables for this additional equipment for associated circuits concerns.	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009
3.3.1.6 [ESFAS Actuation]	The automatic initiation logics for the credited post-fire safe shutdown systems are not required to support safe shutdown. Each system can be controlled manually by operator actuation in the main control room or emergency control station. If operator actions outside the MCR are necessary, those actions must conform to the regulatory requirements on manual actions. However, if not protected from the effects of fire, the fire-induced failure of automatic initiation logic circuits must not adversely affect any post-fire safe shutdown system function.	Aligns	See MSO Technical Report TR08620-025, and Nuclear Safety Capability Assessment Technical Report TR08620-312

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3.3.1.7 [Circuit Coordination]	Cabling for the electrical distribution system is a concern for those breakers that feed associated 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. 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.	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009
3.3.2 Associated Circuit Cables	Appendix R, Section III.G.2, requires that separation features be provided for equipment and cables, including associated nonsafety circuits that could prevent operation or cause maloperation 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 6.1.5 and further clarified in a NRC memorandum dated March 22, 1982 from R. Mattson to D. Eisenhut, Reference 6.1.6. They are as follows: Spurious actuations; Common power source; Common enclosure.	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009
3.3.2 [A, Cables Whose Failure May Cause Spurious Actuations]	Safe shutdown system spurious actuation concerns can result from fire damage to a cable whose failure could cause the spurious actuation/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.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312
3.3.2 [B, Common Power Source Cables]	The concern for the common power source associated circuits 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.	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009
3.3.2. [C, Common Enclosure Cables]	The concern with common enclosure associated circuits 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.	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009

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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 cause associated circuits concerns for a post-fire safe shutdown analysis: [Refer to hard copy of NEI 00-01 for Figure 3-4]	Introductory section, alignment identified in subsections	
3.3.3.1 Identify Circuits Required 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 diagrams; · 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. [Refer to hard copy of NEI 00-01 for Figure 3-2 and 3-3]	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009. Results of required circuits/routing documented in PC-CKS Database.
3.3.3.2 Identify Interlocked Circuits and Cables Whose Spurious Operation or Mal-operation Could Affect 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. [Refer to hard copy of NEI 00-01 for Figure 3-3]	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009
3.3.3.3 Assign Cables to the Safe Shutdown Equipment	Given the criteria/assumptions defined in Section 3.3.1, identify the cables required to operate or that may result in maloperation of each piece of safe shutdown equipment. 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.	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009
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.	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009
3.3.3.5 Identify Location of 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. 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.	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009. Circuit Routing maintained in PC-CKS Database.

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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 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. 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.	Introductory section, alignment identified in subsections	
3.5.1 Criteria/Assumptions	Apply the following criteria/assumptions when performing fire-induced circuit failure evaluations.	Introductory section, alignment identified in subsections	
3.5.1.1 [Circuit Failure Types and Its Impact]	Consider the following circuit failure types on each conductor of each unprotected safe shutdown cable to determine the potential impact of a fire on the safe shutdown equipment associated with that conductor. 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. 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 that RIS 2004-03 indicates that open circuits, as an initial mode of cable failures, are considered to be of very low likelihood. The risk-informed inspection process will focus on failures with relatively high probabilities. 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. Consider the three types of circuit failures identified above to occur individually on each conductor of each safe shutdown cable on the required safe shutdown path in the fire area.	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009
3.5.1.2 [Circuit Contacts and Operational Modes]	Assume that circuit contacts are positioned (i.e., open or closed) consistent with the normal mode/position of the safe shutdown equipment as shown on the schematic drawings. The analyst must consider the position of the 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 safe shutdown equipment.	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009
3.5.1.3 [Duration of Circuit Failures]	Assume that circuit failure types resulting in spurious operations exist until action has been taken to isolate the given circuit from the fire area, or other actions have been taken to negate the effects of circuit failure that is causing the spurious actuation. The fire is not assumed to eventually clear the circuit fault. Note that RIS 2004-03 indicates that fire-induced hot shorts typically self-mitigate after a limited period of time.	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009
3.5.1.4 [Cable Failure Configurations]	When both trains are in the same fire area outside of primary containment, all cables that do not meet the separation requirements of Section III.G.2 are assumed to fail in their worst case configuration.	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009

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3.5.1.5 [A, Circuit Failure General Guidance]	The following guidance provides the NRC inspection focus from Bin 1 of RIS 2004-03 in order to identify any potential combinations of spurious operations with higher risk significance. Bin 1 failures should also be the focus of the analysis; however, NRC has indicated that other types of failures required by the regulations for analysis should not be disregarded even if in Bin 2 or 3. If Bin 1 changes in subsequent revisions of RIS 2004-03, the guidelines in the revised RIS should be followed.	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009
3.5.1.5 [A, Circuit Failure Risk Assessment Guide]	Cable Failure Modes. For multiconductor cables testing has demonstrated that conductor-to-conductor shorting within the same cable is the most common mode of failure. This is often referred to as "intra-cable shorting." It is reasonable to assume that given damage, more than one conductor-to-conductor short will occur in a given cable. A second primary mode of cable failure is conductor-to-conductor shorting between separate cables, commonly referred to as "inter-cable shorting." Inter-cable shorting is less likely than intra-cable shorting. Consistent with the current knowledge of fire-induced cable failures, the following configurations should be considered: For any individual multiconductor cable (thermoset or thermoplastic), any and all potential spurious actuations that may result from intra-cable shorting, including any possible combinatioof conductors within the cable, may be postulated to occur concurrently regardless of number. However, as a practical matter, the number of combinations of potential hot shorts increases rapidly with the number of conductors within a given cable. For example, a multiconductor cable with three conductors (3C) has 3 possible combinations of two (including desired combinations), while a five conductor cable (5C) has 10 possible combinations of two (including desired combinations), and a seven conductor cable (7C) has 21 possible combinations of two (including desired combinations). To facilitate an inspection that considers most of the risk presented by postulated hot shorts within a multiconductor cable, inspectors should consider only a few (three or four) of the most critical postulated combinations.	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009
3.5.1.5 [B, Cable Failure Modes]	For any thermoplastic cable, any and all potential spurious actuations that may result from intra-cable and inter-cable shorting with other thermoplastic cables, including any possible combination of conductors within or between the cables, may be postulated to occur concurrently regardless of number. (The consideration of thermoset cable inter-cable shorts is deferred pending additional research.)	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009
3.5.1.5 [C, Multiple Cable Damage]	For cases involving the potential damage of more than one multiconductor cable, a maximum of two cables should be assumed to be damaged concurrently. The spurious actuations should be evaluated as previously described. The consideration of more than two cables being damaged (and subsequent spurious actuations) is deferred pending additional research.	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009
3.5.1.5 [D, DC circuits]	For cases involving direct current (DC) circuits, the potential spurious operation due to failures of the associated control cables (even if the spurious operation requires two concurrent hot shorts of the proper polarity, e.g., plus-to-plus and minus-to-minus) should be considered when the required source and target conductors are each located within the same multiconductor cable.	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009

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3.5.1.5 [E, Instrumentation Circuits]	*Instrumentation Circuits. Required instrumentation circuits are beyond the scope of* this associated circuit approach and must meet the same requirements as required power and control circuits. There is one case where an instrument circuit could potentially be considered an associated circuit. If fire-induced damage of an instrument circuit could prevent operation (e.g., lockout permissive signal) or cause maloperation (e.g., unwanted start/stop/reposition signal) of systems necessary to achieve and maintain hot shutdown, then the instrument circuit may be considered an associated circuit and handled accordingly.	Aligns	*See NFPA and Fire PRA Circuit Analysis Technical* Report TR07800-009
3.5.1.5 [F, Undesired Consequences]	Likelihood of Undesired Consequences. Determination of the potential consequence of the damaged associated circuits is based on the examination of specific NPP piping and instrumentation diagrams (P&IDs) and review of components that could prevent operation or cause maloperation such as flow diversions, loss of coolant, or other scenarios that could significantly impair the NPP's ability to achieve and maintain hot shutdown. When considering the potential consequence of such failures, the [analyst] should also consider the time at which the prevented operation or maloperation occurs. Failures that impede hot shutdown within the first hour of the fire tend to be most risk significant in a first-order evaluation. Consideration of cold-shutdown circuits is deferred pending additional research.	Aligns	See NSCA ARC software model, results documented in Nuclear Safety Capability Assessment Technical Report TR08620-312
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 on the required safe shutdown path and any other equipment whose spurious operation/mal-operation could affect 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 capable of achieving 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 safe shutdown be free of fire damage and that these circuits be designed for the fire-induced effects of a hot short, short-to-ground, and open circuit. With respect to the electrical distribution system, the issue of breaker coordination must also be addressed. This section will discuss specific examples of each of the following types of circuit failures: Open circuit; Short-to-ground; Hot short.	Introductory section, alignment identified in subsections	

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3.5.2.1 Circuit Failures Due to an Open Circuit	This section provides guidance for addressing the effects of an open circuit for 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. NOTE: The EPRI circuit failure testing indicated that open circuits are not likely to be the initial fire-induced circuit failure mode. Consideration of this may be helpful within the safe shutdown analysis. Consider the following consequences in the safe shutdown circuit analysis when determining the effects of open circuits: Loss of electrical continuity may occur within a conductor resulting in deenergizing the circuit and causing a loss of power to, or control of, the required 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. [Refer to hard copy of NEI 00-01 for Figure 3.5.2-1] Open circuit No. 1: An open circuit at location No. 1 will prevent operation of the subject equipment. Open circuit No. 2: An open circuit at location No. 2 will prevent opening/starting of the subject equipment, but will not impact the ability to close/stop the equipment.	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009
3.5.2.2 Circuit Failures Due to a Short-to-Ground [A, General]	This section provides guidance for addressing the effects of a short-to-ground on circuits for 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. 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.	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009
3.5.2.2 Circuit Failures Due to a Short-to-Ground [B, Grounded Circuits]	Typically, in the case of a grounded circuit, a short-to-ground on any part of the circuit would present a concern for tripping the circuit isolation device thereby causing a loss of control power. Figure 3.5.2-2 illustrates how a short-to-ground fault may impact a grounded circuit. Short-to-ground No. 1: A short-to-ground at location No. 1 will result in the control power fuse blowing and a loss of power to the control circuit. This will result an inability to operate the equipment using the control switch. Depending on the coordination characteristics between the protective device on this circuit and upstream circuits, the power supply to other circuits could be affected. Short-to-ground No. 2: A short-to-ground at location No. 2 will have no effect on the circuit until the close/stop control switch is closed. Should this occur, the effect would be identical to that for the short-to-ground at location No. 1 described above. Should the open/start control switch be closed prior to closing the close/stop control switch, the equipment will still be able to be opened/started. [Refer to hard copy of NEI 00-01 for Figure 3.5.2-2]	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009

3.5.2.2 Circuit Failures Due to a Short-to-Ground [C, 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 circuit isolation 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. Figure 3.5.2-3 illustrates how a short to ground fault may impact an ungrounded circuit. Short-to-ground No. 1: A short-to-ground at location No. 1 will result in the control power fuse blowing and a loss of power to the control circuit if short-to-ground No. 3 also exists either within the same circuit or on any other circuit fed from the same power source. This will result in an inability to operate the equipment using the control switch. Depending on the coordination characteristics between the protective device on this circuit and upstream circuits, the power supply to other circuits could be affected. Short-to-ground No. 2: A short-to-ground at location No. 2 will have no effect on the circuit until the close/stop control switch is closed. Should this occur, the effect would be identical to that for the short-to-ground at location No. 1 described above. Should the open/start control switch be closed prior to closing the close/stop control switch, the equipment will still be able to be opened/started. [Refer to hard copy of NEI 00-01 for Figure 3.5.2-3]	Aligns	See NFPA and Fire PRA Circuit Analysis Technical Report TR07800-009
3.5.2.3 Circuit Failures Due to a Hot Short [A, General]	This section provides guidance for analyzing the effects of a hot short oncircuits for required 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 actuation of equipment. The spuriously actuated device (e.g., relay) may be interlocked with another circuit that causes the spurious actuation of other equipment. This type of hot short is called a 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 (thermoplastic cables only) and a de-energized conductor may also cause a spurious actuation of equipment. This is called a cable-to-cable hot short or an external hot short. Cable-to-cable hot shorts between thermoset cables are not postulated to occur pending additionalresearch.	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009
3.5.2.3 Circuit Failures Due to a Hot Short [B, Grounded Circuits]	A short-to-ground is another failure mode for a grounded control circuit. A short-to-ground as described above would result in de-energizing the circuit. This would further reduce the likelihood for the circuit to change the state of the equipment either from a control switch or due to a hot short. Nevertheless, a hot short still needs to be considered. Figure 3.5.2-4 shows a typical grounded control circuit that might be used for a motor-operated valve. However, the protective devices and position indication lights that would normally be included in the control circuit for a motor-operated valve have been omitted, since these devices are not required to understand the concepts being explained in this section. In the discussion provided below, it is assumed that a single fire in a given fire area could cause any one of the hot shorts depicted. The following discussion describes how to address the impact of these individual cable faults on the operation of the equipment controlled by this circuit. Hot short No. 1: A hot short at this location would energize the close relay and result in the undesired closure of a motor-operated valve. Hot short No. 2: A hot short at this location would energize the open relay and result in the undesired opening of a motor-operated valve. [Refer to hard copy of NEI 00-01 for Figure 3.5.2-4]	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009

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3.5.2.3 Circuit Failures Due to a Hot Short [C, Ungrounded Circuits]	In the case of an ungrounded circuit, a single hot short may be sufficient to cause a spurious operation. A single hot short can cause a spurious operation if the hot short comes from a circuit from the positive leg of the same ungrounded source as the affected circuit. In reviewing each of these cases, the common denominator is that in every case, the conductor in the circuit between the control switch and the start/stop coil must be involved. Figure 3.5.2-5 depicted below {see Figure in NEI 00-01, Rev 1] shows a typical ungrounded control circuit that might be used for a motor-operated valve. However, the protective devices and position indication lights that would normally be included in the control circuit for a motor-operated valve have been omitted, since these devices are not required to understand the concepts being explained in this section. In the discussion provided below, it is assumed that a single fire in a given fire area could cause any one of the hot shorts depicted. The discussion provided below describes how to address the impact of these cable faults on the operation of the equipment controlled by this circuit. Hot short No. 1: A hot short at this location from the same control power source would energize the close relay and result in the undesired closure of a motor operated valve. Hot short No. 2: A hot short at this location from the same control power source would energize the open relay and result in the undesired opening of a motor operated valve. [Refer to hard copy of NEI 00-01 for Figure 3.5.2-5]	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009

NFPA 805 Section ***2.4.2.3* Nuclear Safety Equipment and Cable Location.***

Physical location of equipment and cables shall be identified. (See Appendix B for considerations when identifying locations.)

[Note: A.2.4.2.3 Equipment and cables should be located by the smallest designator (room, fire zone, or fire area) for ease of analysis.]

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
3.5.2.4 Circuit Failures Due to Inadequate Circuit Coordination [A, General]	The evaluation of associated 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 safe 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. For the example shown in Figure 3.5.2-6, the circuit powered from load breaker 4 supplies power to a non-safe shutdown pump. This circuit is damaged by fire in the same fire area as the circuit providing power to from the Train B bus to the Train B pump, which is redundant to the Train A pump. To assure safe shutdown for a fire in this fire area, the damage to the non-safe shutdown pump powered from load breaker 4 of the Train A bus cannot impact the availability of the Train A pump, which is redundant to the Train B pump. To assure that there is no impact to this Train A pump due to the associated circuits' common power source breaker coordination issue, load breaker 4 must be fully coordinated with the feeder breaker to the Train A bus. 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. [Refer to hard copy of NEI 00-01 for Figure 3.5.2-6]	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009
3.5.2.4 Circuit Failures Due to Inadequate Circuit Coordination [A, Methodology]	The methodology for identifying potential associated circuits of a common power source and evaluating circuit coordination cases of associated circuits 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 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 associated circuit cables of concern are routed and the power source is required for safe 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 associated circuit of concern cables routed in an area of the same path as required by the power source. Evaluate adequate separation based upon the criteria in Appendix R, NRC staff guidance, and plant licensing bases.	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009

NFPA 805 Section ***2.4.2.3* Nuclear Safety Equipment and Cable Location.***

3.5.2.5 Circuit Failures Due to Common Enclosure Concerns	The common enclosure associated circuit 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.	Aligns	See Circuit analysis Project Instruction PI 4.4 and Technical Report TR07800-009

NFPA 805 Section ***2.4.2.4 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)].

(See Appendix B for considerations when performing the fire area assessments.)

NEI 00-01 Section	NEI 00-01 Section Description	NFPA 805 Alignment	NFPA 805 Reference
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. 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.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312
3.4.1 Criteria/Assumptions	The following criteria and assumptions apply when performing 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.	Introductory section, alignment identified in subsections	
3.4.1.1 [Number of Postulated Fires]	Assume only one fire in any single fire area at a time.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312
3.4.1.2 [Damage to Unprotected Equipment and Cables]	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 required by the regulation.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312
3.4.1.3 [Assess Impacts to Required Components]	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.	Aligns	See NSCA ARC software model and TR08620-312
3.4.1.4 [Manual Actions]	Use manual actions where appropriate to achieve and maintain post fire safe shutdown conditions in accordance with NRC requirements.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312
3.4.1.5 [Cold Shutdown Repairs]	Where appropriate to achieve and maintain cold shutdown within 72 hours, use repairs to equipment required in support of post-fire shutdown.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312

3.4.1.6 [Assess Compliance With Deterministic Criteria]	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, including associated circuits, 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 path(s): - Separation of cables and equipment and associated nonsafety 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 nonsafety 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 noninerted containments, the following additional options are also available: - Separation of cables and equipment and associated nonsafety 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); or - 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 and licensing change processes to satisfy the requirements mentioned above and to demonstrate equivalency depending upon the plant's license requirements.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312
3.4.1.7 [Consider Additional Equipment]	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 operations, is to be addressed in accordance with regulatory requirements and the NPP's current licensing basis.	Aligns	See Nuclear Safety Capability Assessment Technical Report TR08620-312
3.4.1.8 [Consider Instrument Tubing 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 post fire safe shutdown capability. This can be done systematically or via procedures such as Emergency Operating Procedures.	Aligns	Technical Report TR08620-019. See ARC software model for impacts.
3.4.2 Methodology for Fire Area Assessment	Refer to 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: [Refer to hard copy of NEI 00-01 for Figure 3-5]	Introductory section, alignment identified in subsections	
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 (see Attachment 5 for an example of an Affected Equipment Report).	Aligns	See NSCA ARC software model and TR08620-312

NFPA 805 Section ***2.4.2.4 Fire Area Assessment***

3.4.2.2 Determine the Shutdown Paths Least Impacted By a Fire in Each Fire Area	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. Based on an assessment as described above, designate the required safe shutdown path(s) for the fire area. Identify all equipment not in the safe shutdown path whose spurious operation or mal-operation could affect the shutdown function. Include these 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.	Aligns	See NSCA ARC software model and TR08620-312
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.	Aligns	See NSCA ARC software model and TR08620-312
3.4.2.4 Develop a Compliance Strategy or Disposition to Mitigate the Effects Due to Fire Damage to Each Required Component or Cable	The available deterministic methods for mitigating the effects of circuit failures are summarized as follows (see Figure 1-2): - 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. - Reroute or relocate the circuit/equipment, or perform other modifications to resolve vulnerability. - Provide a procedural action in accordance with regulatory requirements. - 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, Generic Letter 86-10 evaluation or fire protection design change evaluations with a licensing change process. Additional options are available for non-inerted containments as described in 10 CFR 50 Appendix R section III.G.2.d, e and f. [Refer to hard copy of NEI 00-01 for Figure 1-2]	Aligns	See NSCA ARC software model, results documented in Nuclear Safety Capability Assessment Technical Report TR08620-312

NFPA 805 Section ***2.4.2.4 Fire Area Assessment***

3.4.2.5 Document the Compliance Strategy or Disposition Determined to Mitigate the Effects Due to Fire Damage to Each Required Component or Cable	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. [Refer to hard copy of NEI 00-01 for Attachment 6]	Aligns	See NSCA ARC software model, results documented in Nuclear Safety Capability Assessment Technical Report TR08620-312

E. NEI 04-02 Radioactive Release Transition

17 Pages Attached

Radioactive Release Analysis

Compartmentation

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

Training and Procedure Review

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

Pre-Fire Plan Review

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

Engineered Controls Review

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

F. Fire-Induced Multiple Spurious Operations Resolution

4 Pages Attached

MSO Process Summary

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

Step 1 – Identify potential MSOs of concern

Information sources that may be used as input include:

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

Results of Step 1:

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

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

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

Results of Step 2:

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

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

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

Results of Step 3:

The results of the expert panel were included in the final component selection process and input into both the Fire PRA Model and NSCA. However, the original PRA

screening function of Steps 3 and 4 was not done for MSOs, and instead were included directly into the NSCA model and evaluated for inclusion into the Fire PRA model.

Step 4 – Identify the risk significance of MSOs of concern

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

Results of Step 4:

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

Step 5 – Update the NSCA Fire SSCA

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

Results of Step 5:

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

Step 6 – Evaluate for NFPA 805 Compliance

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

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

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

Results of Step 6:

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

Step 7 - Document Results

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

Results of Step 7:

The results are documented in:

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

H. NFPA 805 Frequently Asked Question Summary Table

3 Pages Attached

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

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

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

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

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

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

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

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

I. Definition of Power Block

2 Pages Attached

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

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

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

Table I-1 – VCSNS Power Block Definition

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

J. Fire Modeling V&V

6 Pages Attached

1. Fire Models

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

Table J-1 Fire Models used in the Analysis

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

1.1 Verification and Validation

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

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

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

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

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

1.2 Model Application Range

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

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

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

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

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

Table J-2 NUREG 1824 dimensionless group validation range analysis

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

Notes:

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

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

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

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

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

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

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

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

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

1.3 Documentation

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

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

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

K. Existing Licensing Action Transition

25 Pages Attached

Fire Area: AB01

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

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

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

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

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

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

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

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

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

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

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

FPEEE Reference: NA

Fire Area: AB01

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

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

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

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

- AB01.21

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

Fire Area: CB02

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

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

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

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

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

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

Fire Area: CB12

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

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

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

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

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

FPEEE Reference: NA

Fire Area: CB17

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

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

Details: Control Room does not have a fixed suppression system

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

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

FPEEE Reference: NA

Fire Area: IB03

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

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

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

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

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

FPEEE Reference: NA

Fire Area: IB04

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

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

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

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

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

FPEEE Reference: NA

Fire Area: IB07

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

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

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

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

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

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

Fire Area: IB10

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

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

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

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

- IB10 23-02

FPEEE Reference: NA

Fire Area: IB11

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

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

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

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

- IB11 26-01

FPEEE Reference: NA

Fire Area: IB12

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

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

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

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

- IB12 26-02

FPEEE Reference: NA

Fire Area: IB16

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

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

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

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

- IB16 51-01

FPEEE Reference: NA

Fire Area: IB17

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

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

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

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

- IB17 51-02

FPEEE Reference: NA

Fire Area: IB19

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

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

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

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

- IB19 51-03

FPEEE Reference: NA

Fire Area: IB24

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

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

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

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

- IB24 36-03B

FPEEE Reference: NA

Fire Area: IB25

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

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

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

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

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

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

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

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

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

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

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

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

Fire Area: IB25

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

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

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

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

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

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

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

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

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

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

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

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

Fire Area: IB25

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

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

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

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

- IB25.06.01 PA 36-02

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

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

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

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

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

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

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

Fire Area: **MH02**

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

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

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

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

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

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

Fire Area: RB01

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

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

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

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

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

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

Fire Area: SWPH05

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

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

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

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

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

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

Fire Area: Various

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

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

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

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

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

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

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

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

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

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

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

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

Fire Area: YD01

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

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

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

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

- YD01

FPEEE Reference: NA

Fire Area: YD02

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

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

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

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

- YD02

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

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

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

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

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

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

FPEEE Reference: NA

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

14 Pages Attached

Approval Request L1

NFPA 805 Section: 3.3.1.2 (1) Wood

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

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

Acceptance Criteria Evaluation:

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

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

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

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

Approval Request L2

NFPA 805 Section: 3.3.5.1 Wiring

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

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

Acceptance Criteria Evaluation:

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

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

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

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

Approval Request L3

NFPA 805 Section 3.3.5.3 Electrical Cable Construction

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

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

Acceptance Criteria Evaluation:

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

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

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

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

Approval Request L4

NFPA 805 Section: 3.3.7.2 Bulk Gas Storage

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

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

Acceptance Criteria Evaluation:

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

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

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

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

Approval Request L5

NFPA 805 Section 3.4.1 (d) Fire Brigade Notification

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

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

Acceptance Criteria Evaluation:

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

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

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

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

Approval Request L6

NFPA 805 Section: 3.4.2.4 Pre-Fire Plans

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

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

Acceptance Criteria Evaluation:

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

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

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

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

Approval Request L7

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

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

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

Acceptance Criteria Evaluation:

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

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

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

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

Approval Request L8

NFPA 805 Section: 3.5.15 Yard Fire Hydrant Layout

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

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

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

Acceptance Criteria Evaluation:

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

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

Conclusion:

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

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

Approval Request L9

NFPA 805 Section: 3.6.2 Hose Stations

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

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

Acceptance Criteria Evaluation:

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

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

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

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

Approval Request L10

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

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

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

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

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

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

Acceptance Criteria Evaluation:

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

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

Conclusion:

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

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

Approval Request L11

NFPA 805 Section: 3.8.2 Detection

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

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

Acceptance Criteria Evaluation:

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

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

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

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

M. License Condition Changes

4 Pages Attached

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

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

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

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

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

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

Other Changes that May Be Made Without Prior NRC Approval

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

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

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

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

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

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

Transition License Conditions

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

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

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

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

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

Fire Protection System (Section 9.5.1. SSER 4)

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

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

No other license conditions need to be revised or superseded.

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

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

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

N. Technical Specification Changes

2 Pages Attached

Delete the following Technical Specification:

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

f. Fire Protection Program

No other Technical Specifications need to be revised or deleted.

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

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

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

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

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

O. Orders and Exemptions

2 Pages Attached

Exemptions

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

Orders

No Orders need to be superseded or revised.

VCSNS implemented the following process for making this determination:

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

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

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

1 Page Attached

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

Q. No Significant Hazards Evaluations

4 Pages Attached

No Significant Hazard Consideration

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

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

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

Response: No.

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

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

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

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

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

Response: No.

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

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

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

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

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

Response: No.

Operation of VCSNS in accordance with the proposed amendment does not involve a significant reduction in the margin of safety. The proposed amendment does not alter the manner in which safety limits, limiting safety system settings or limiting conditions for operation are determined. The safety analysis acceptance criteria are not affected by this change. The proposed amendment does not

adversely affect existing plant safety margins or the reliability of equipment assumed to mitigate accidents in the UFSAR. The proposed amendment does not adversely affect the ability of SSCs to perform their design function. SSCs required to safely shut down the reactor and to maintain it in a safe shutdown condition remain capable of performing their design functions.

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

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

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

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

R. Environmental Considerations Evaluation

2 Pages Attached

Environmental Consideration

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

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

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

This amendment meets the following specific criteria:

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

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

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

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

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

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

S. Plant Modifications and Items to be Completed During Implementation

7 Pages Attached

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

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

Table S-1 Plant Modifications Committed

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

Table S-1 Plant Modifications Committed

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

Table S-1 Plant Modifications Committed

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

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

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

Table S-2 Implementation Items

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

Table S-2 Implementation Items

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

Table S-2 Implementation Items

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

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

T. Clarification of Prior NRC Approvals

1 Page Attached

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

U. Internal Events PRA Quality

21 Pages Attached

In accordance with RG 1.205 Regulatory Position 4.3:

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

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

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

The F&Os are shown below.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

V. Fire PRA Quality

55 Pages Attached

In accordance with RG 1.205 Regulatory Position 4.3:

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

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

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

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

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

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

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

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

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

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

Table V-1 Peer Review Insights

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

Table V-1 Peer Review Insights

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

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

Table V-2 Classification of Fire PRA Peer Review Results

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

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

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

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

* VCSNS did not perform qualitative screening.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Table V-11 PRA Technical Element Summary: Human Reliability Analysis (HRA)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Table V-16 Capability Categories of Supporting Requirements

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

Table V-16 Capability Categories of Supporting Requirements		
SR	Capability Category	Active F&Os
CS-A9	Met	CS-A9-01
CS-A10	CC III	CS-A10-01
CS-A11	NA	
CS-B1	Not Met	CS-B1-01
CS-C1	Met	CS-C1-01, CS-C2-01
CS-C2	Met	CS-C2-01, CS-C1-01
CS-C3	NA	
CS-C4	Not Met	CS-B1-01
QLS-A1	NA	QLS Not Performed
QLS-A2	NA	QLS Not Performed
QLS-A3	NA	QLS Not Performed
QLS-A4	NA	QLS Not Performed
QLS-B1	NA	QLS Not Performed
QLS-B2	NA	QLS Not Performed
QLS-B3	NA	QLS Not Performed
PRM-A1	Met	
PRM-A2	Met	
PRM-A3	Met	
PRM-A4	Met	ES-B4-01, PRM-A4-01, PRM-A4-02, PRM-A4-03, PRM-A4-04, PRM-A4-05
PRM-B1	Met	
PRM-B2	Met	
PRM-B3	Met	ES-A1-01
PRM-B4	NA	
PRM-B5*	Met	PRM-B5-01
PRM-B6	NA	
PRM-B7	Met	PRM-B7-01
PRM-B8	NA	
PRM-B9	Met	PRM-B9-01, PRM-B9-02
PRM-B10	Met	ES-B1-03
PRM-B11	Met	
PRM-B12	Met	
PRM-B13	Met	
PRM-B14	Met	ES-B3-01

Table V-16 Capability Categories of Supporting Requirements

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

Table V-16 Capability Categories of Supporting Requirements

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

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

Table V-16 Capability Categories of Supporting Requirements

Table V-16 Capability Categories of Supporting Requirements

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

* Information based on follow-on peer review.

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

Table V-17 Summary of Facts and Observations

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

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

**VCSNS did not perform Qualitative Screening.

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

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

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

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

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

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

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

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

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

Table V-18 Facts and Observations Detail

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

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

X. Other Requests for Approval

3 Pages Attached

Approval Request X1

NFPA 805 Section: 4.2.3.3 (b)

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

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

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

Acceptance Criteria Evaluation:

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

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

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

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

Conclusion:

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

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

RC-11-0149

Enclosure 2

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

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

SCE&G
A SCANA COMPANY

List of Regulatory Commitments

November 15, 2011

VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)

ENCLOSURE 2

LIST OF REGULATORY COMMITMENTS

FIRE PROTECTION PROGRAM TRANSITION TO NFPA 805

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

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

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

RC-11-0149

Enclosure 3

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

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

SCE&G®
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Operating License & Technical Specification Changes

November 15, 2011

VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)

ENCLOSURE 3

Operating License & Technical Specification Changes

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

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

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

Proposed Operating License Condition Changes (Markup)

4 Pages

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

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

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

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

(13) Deleted

(14) Deleted

(15) Deleted

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

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

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

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

Delete and Replace With Attachment I →

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

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

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

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

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

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

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

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

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

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

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

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

(23) NUREG-0737 Conditions (Section 22)

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

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

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

Operating License Condition – Attachment 1

Fire Protection System

South Carolina & Electric Gas Company shall implement and maintain in effect all provisions of the approved fire protection program that comply with 10 CFR 50.48(a) and 10 CFR 50.48(c), as specified in the licensee amendment request dated November 14, 2011 and as approved in the safety evaluation report dated __________. Except where NRC approval for changes or deviations is required by 10 CFR 50.48(c), and provided no other regulation, technical specification, license condition or requirement would require prior NRC approval, the licensee may make changes to the fire protection program without prior approval of the Commission if those changes satisfy the provisions set forth in 10 CFR 50.48(a) and 10 CFR 50.48(c), the change does not require a change to a technical specification or a license condition, and the criteria listed below are satisfied.

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

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

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

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

Other Changes that May Be Made Without Prior NRC Approval

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

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

Operating License Condition – Attachment 1

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

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

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

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

Transition License Conditions

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

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

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

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

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

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

(9) Design Description - Control (Section 4.3.2. SER)

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

(13) Deleted

(14) Deleted

(15) Deleted

(16) Cable Tray Separation ISection 8.3.3. SSER 4]

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

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

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

(18) Fire Protection System

South Carolina Electric & Gas Company shall implement and maintain in effect all provisions of the approved fire protection program that comply with 10 CFR 50.48(a) and 10 CFR 50.48(c), as specified in the licensee amendment request dated November 14, 2011 and as approved in the safety evaluation report dated ___________. Except where NRC approval for changes or deviations is required by 10 CFR 50.48(c), and provided no other regulation, technical specification, license condition or requirement would require prior NRC approval, the licensee may make changes to the fire protection program without prior approval of the Commission if those changes satisfy the provisions set forth in 10 CFR 50.48(a) and 10 CFR 50.48(c), the change does not require a change to a technical specification or a license condition, and the criteria listed below are satisfied.

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

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

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

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

Other Changes that May Be Made Without Prior NRC Approval

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

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

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

system, procedure, or physical arrangement, using a relevant technical requirement or standard. The four specific sections of NFPA 805, Chapter 3, are as follows:

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- Gaseous Fire Suppression Systems (Section 3.10); and,
- Passive Fire Protection Features (Section 3.11).

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

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

Transition License Conditions

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

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

- ECR50577: NFPA 805 Instrument Air Recovery
- ECR50780: Alternate Seal Injection (MSPI)
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- ECR50811: NFPA 805 Incipient Detection
- ECR50812: NFPA 805 Disconnect Switch Rework
- ECR70588: NFPA 805 Penetration Seal Documentation
- ECR71553: NFPA 805 Communication

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

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

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

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

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

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

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

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

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

(23) NUREG-0737 Conditions (Section 22)

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

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

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

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

6.8 PROCEDURES AND PROGRAMS

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

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

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

6.8.3 NOT USED.

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

a. Primary Coolant Sources Outside Containment

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

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

b. In-Plant Radiation Monitoring

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

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

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e. Emergency Plan.
f. PROCESS CONTROL PROGRAM.
g. OFFSITE DOSE CALCULATION MANUAL.
h. Effluent and environmental monitoring program using the guidance in Regulatory Guide 4.15, Revision 1, February 1979.

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

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a. Primary Coolant Sources Outside Containment

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1) Training of personnel,
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