Thomas D. Gatlin
Vice President, Nuclear Operations
803.345.4342

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.

Virgil C. Summer Station • Post Office Box 88 • Jenkinsville, SC • 29065 • T (803) 345-5209

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
A SCANA COMPANY

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.

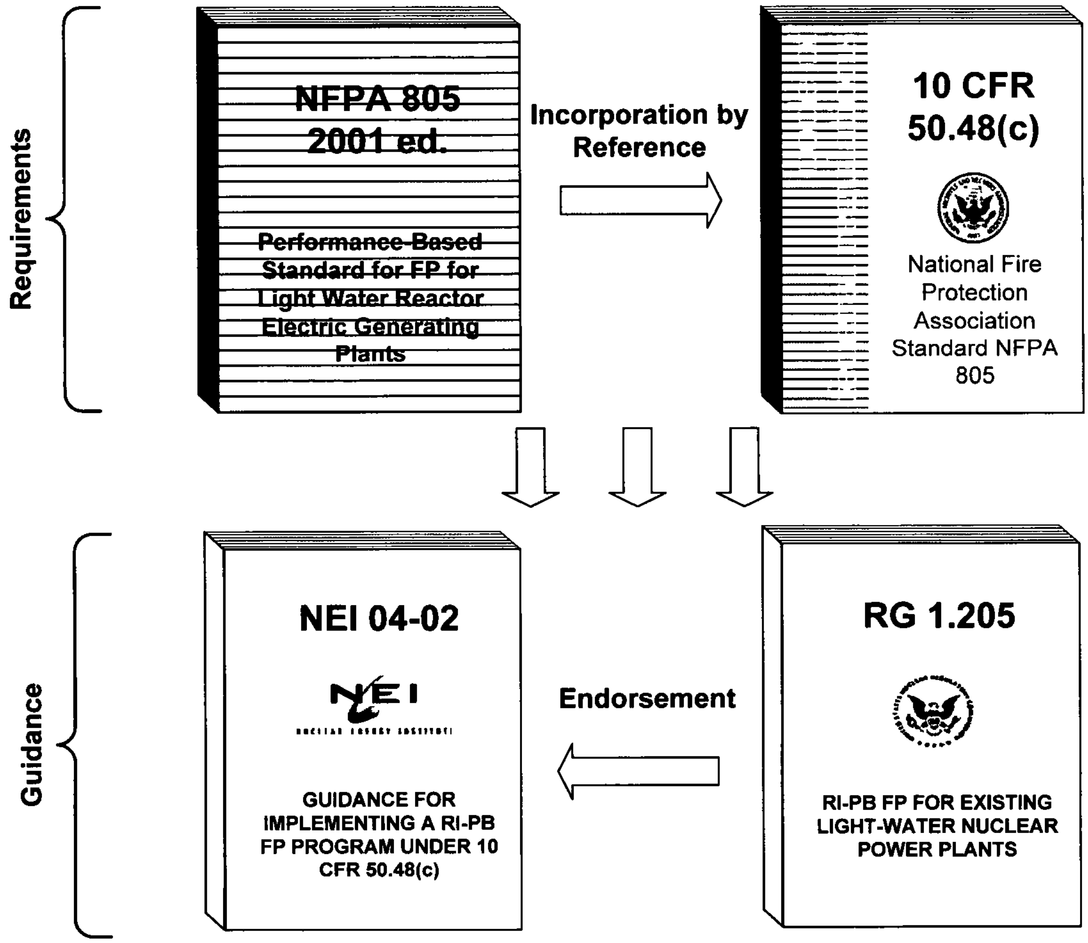

Figure 1-1 NFPA 805 Transition – Implementation Requirements/Guidance

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.

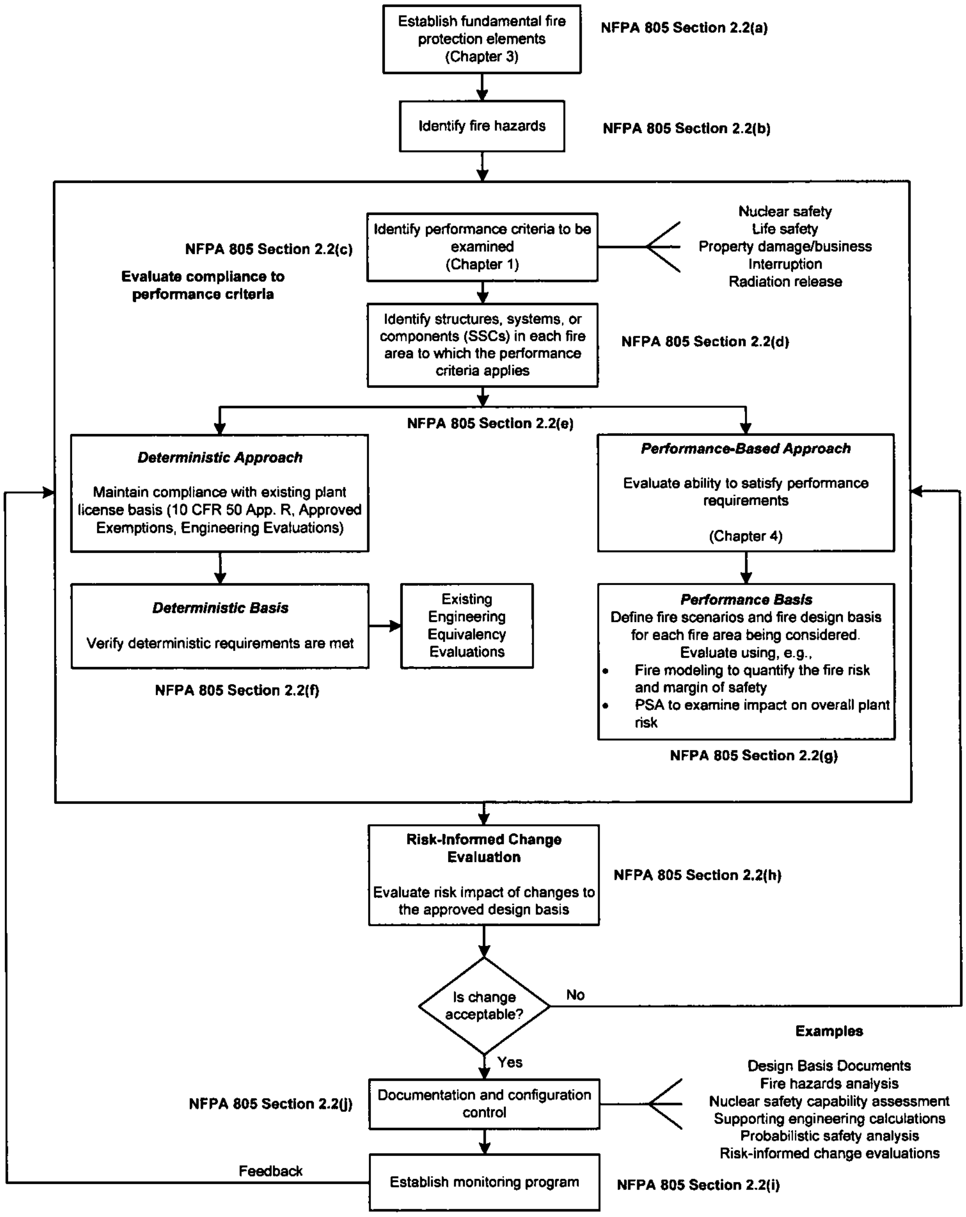

Figure 3-1 NFPA 805 Process [NEI 04-02 Figure 3-1 based on Figure 2-2 of NFPA 805][2]

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.

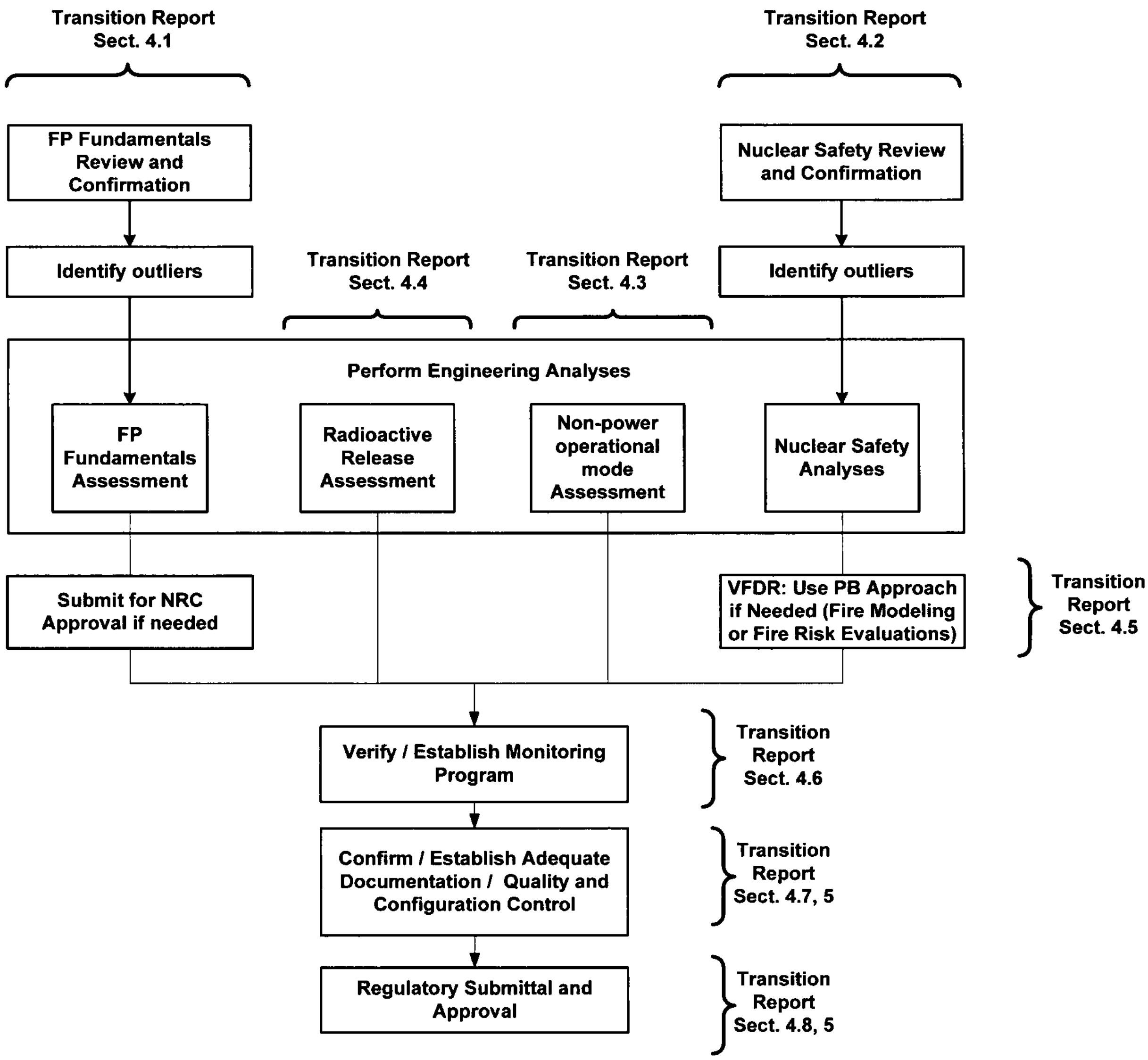

Figure 3-2 Transition Process (Simplified)
[based on NEI 04-02 Figure 4-1 and modified per the VCSNS process]

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.

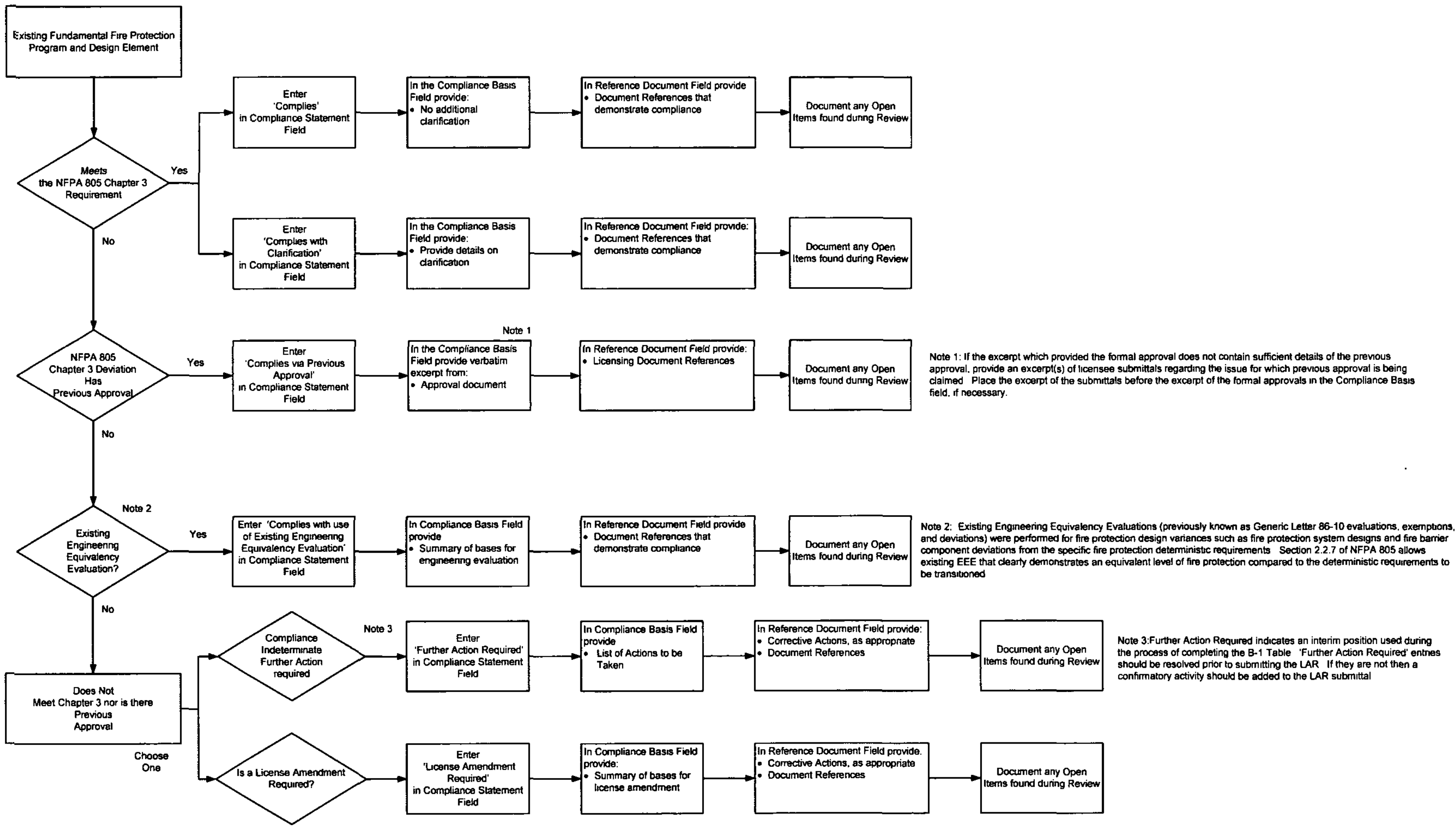

Figure 4-1 Fundamental Fire Protection Program and Design Elements Transition Process [Based on NEI 04-02 Figure 4-2][3]

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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 operation	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
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.

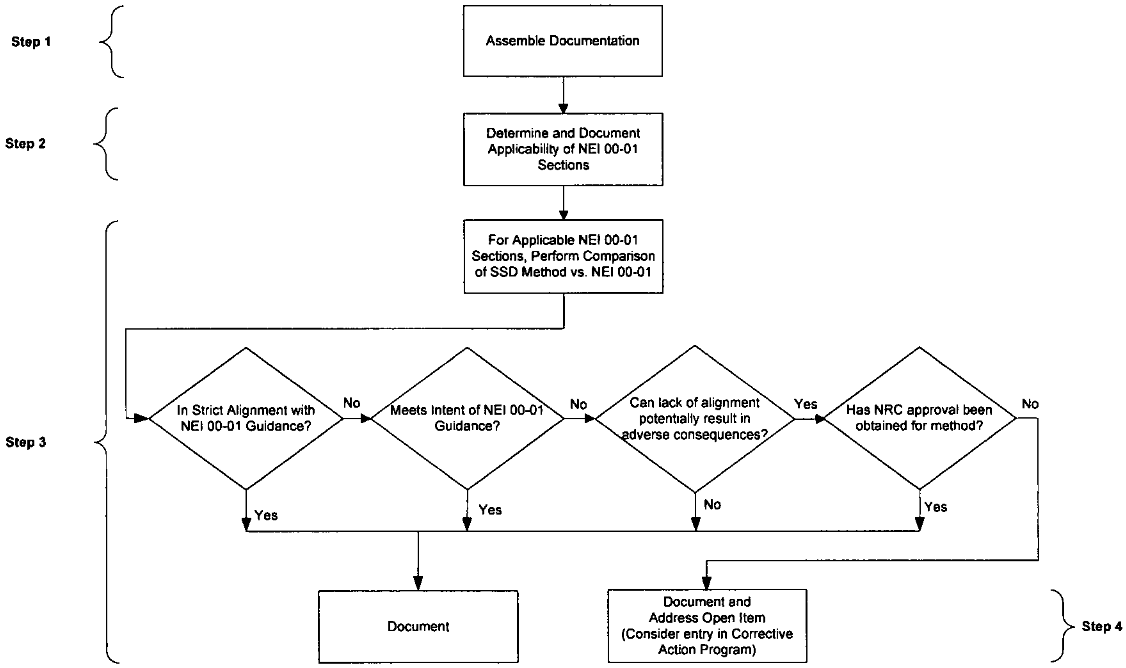

Figure 4-2 Summary of Nuclear Safety Methodology Review Process (FAQ 07-0039)

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 <u>not</u> 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.

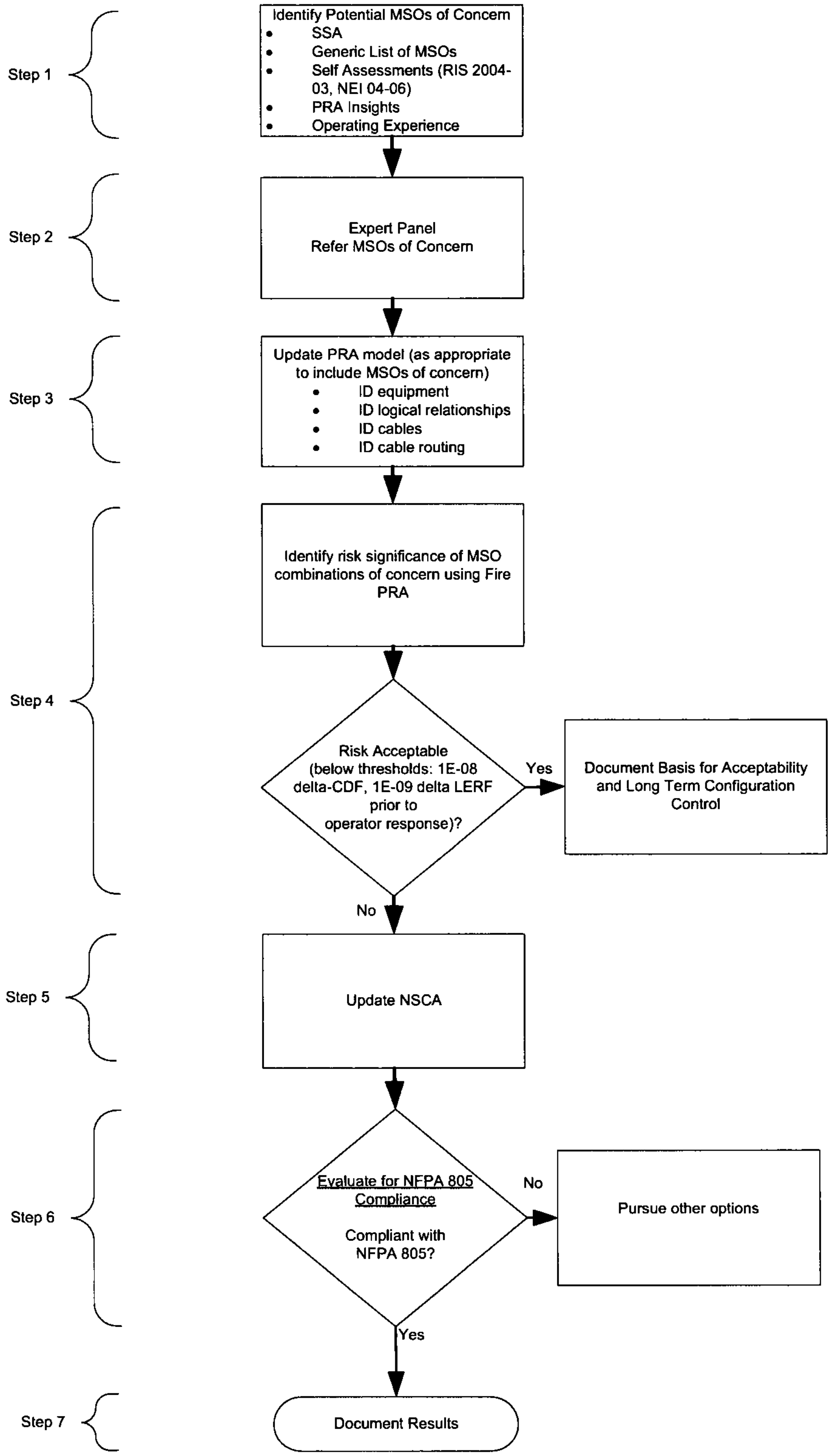

Figure 4-3 Multiple Spurious Operations – Transition Resolution Process (Based on FAQ 07-0038 Revision 1 and later modified)

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.

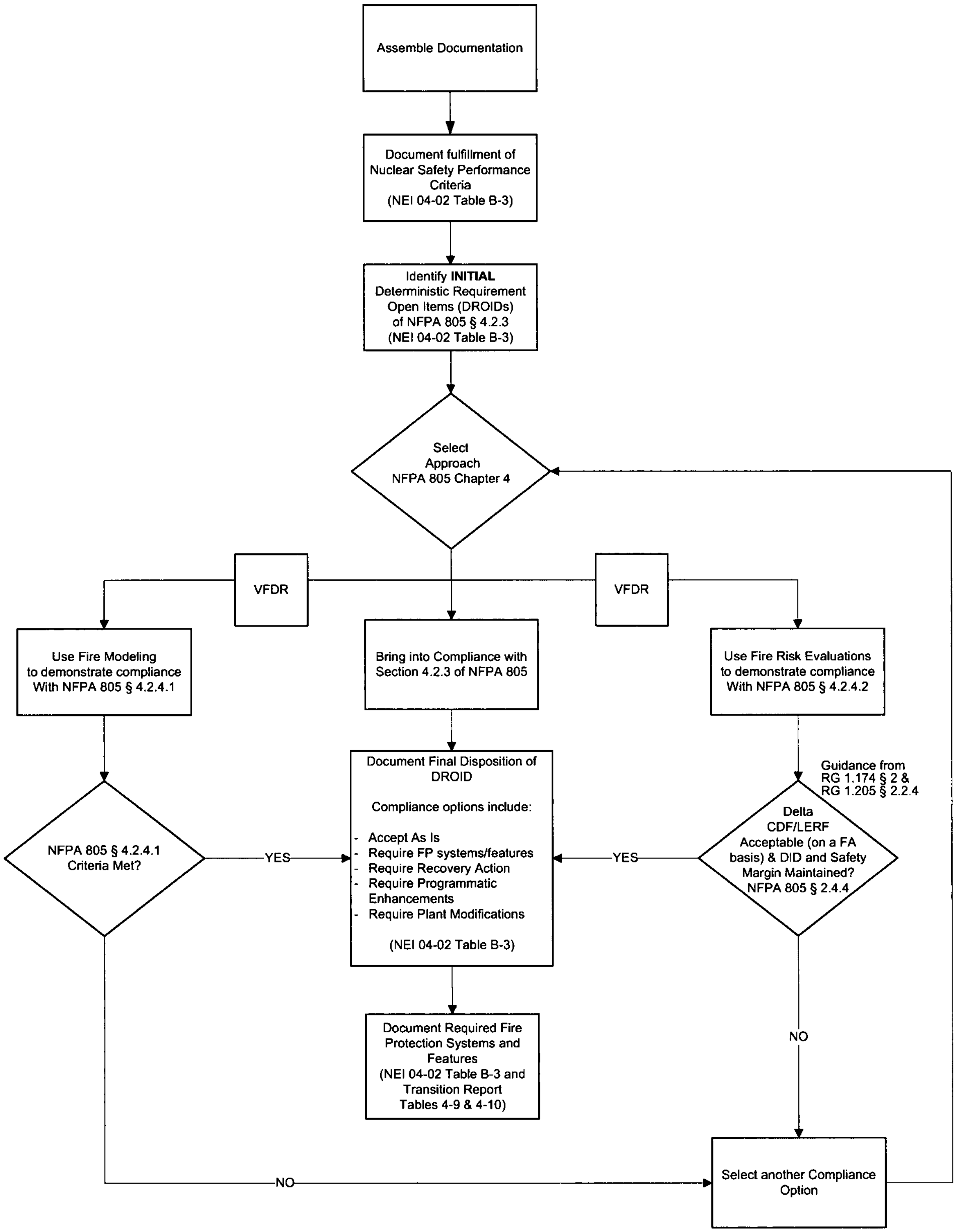

Figure 4-4 Summary of Fire Area Review
[Based on FAQ 07-0054 Revision 1 and modified per the VCSNS process]

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.

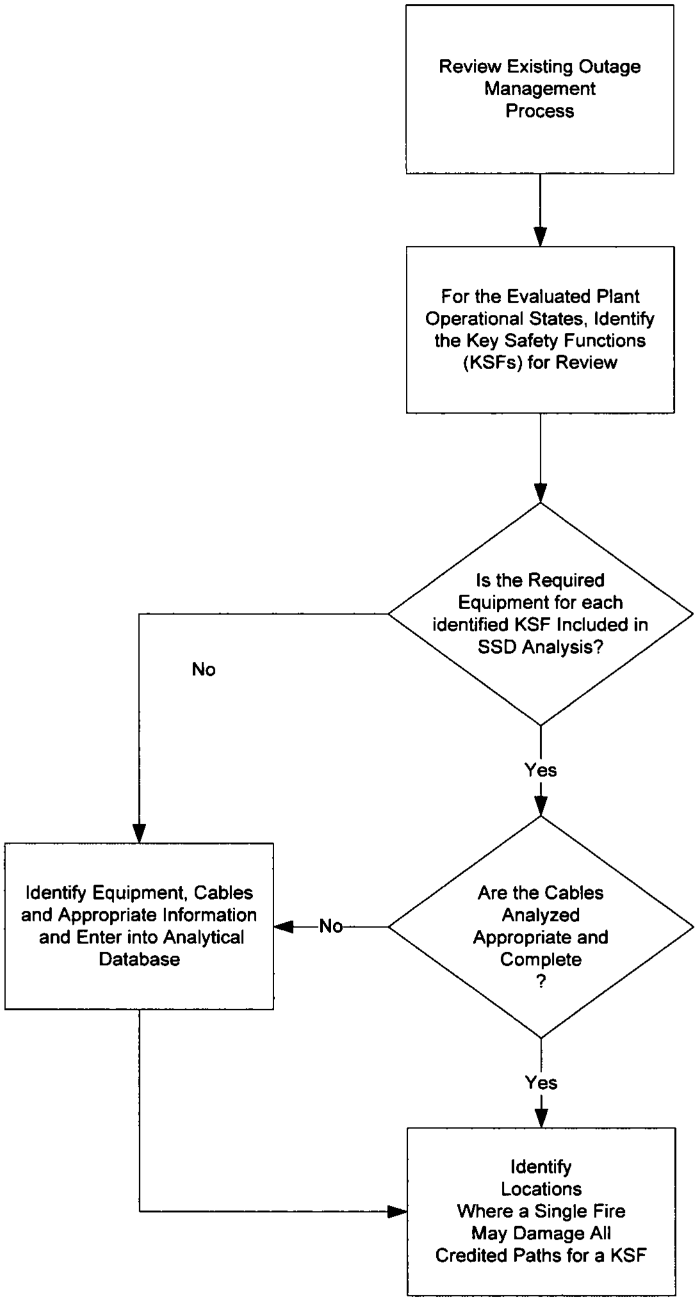

Figure 4-5 Review POSs, KSFs, Equipment, and Cables, and Identify Pinch Points

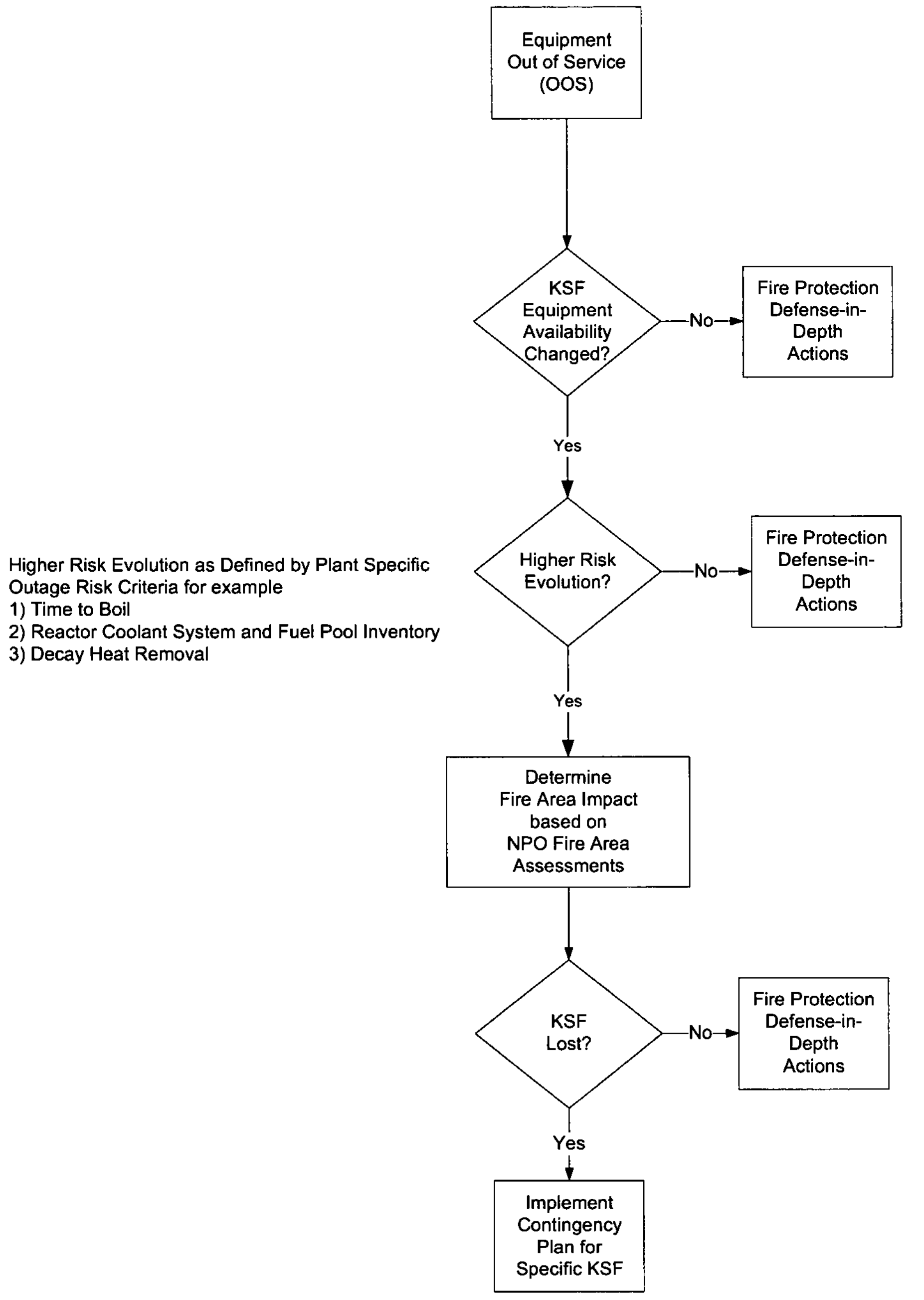

Figure 4-6 Manage Pinch Points

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 <u>Attachment U</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.

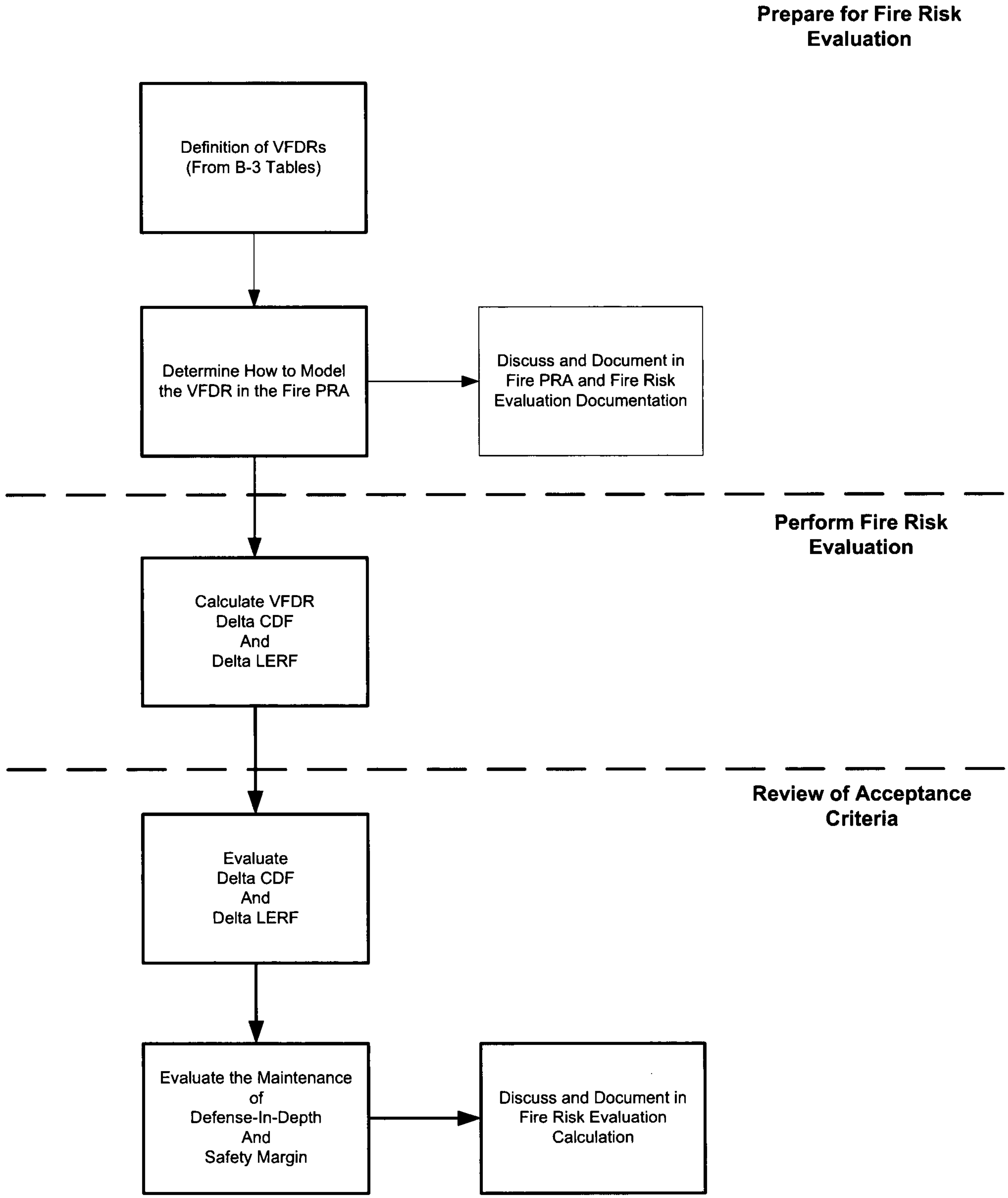

Figure 4-7 Fire Risk Evaluation Process (NFPA 805 Transition) [Based on FAQ 07-0054 Revision 1]

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.

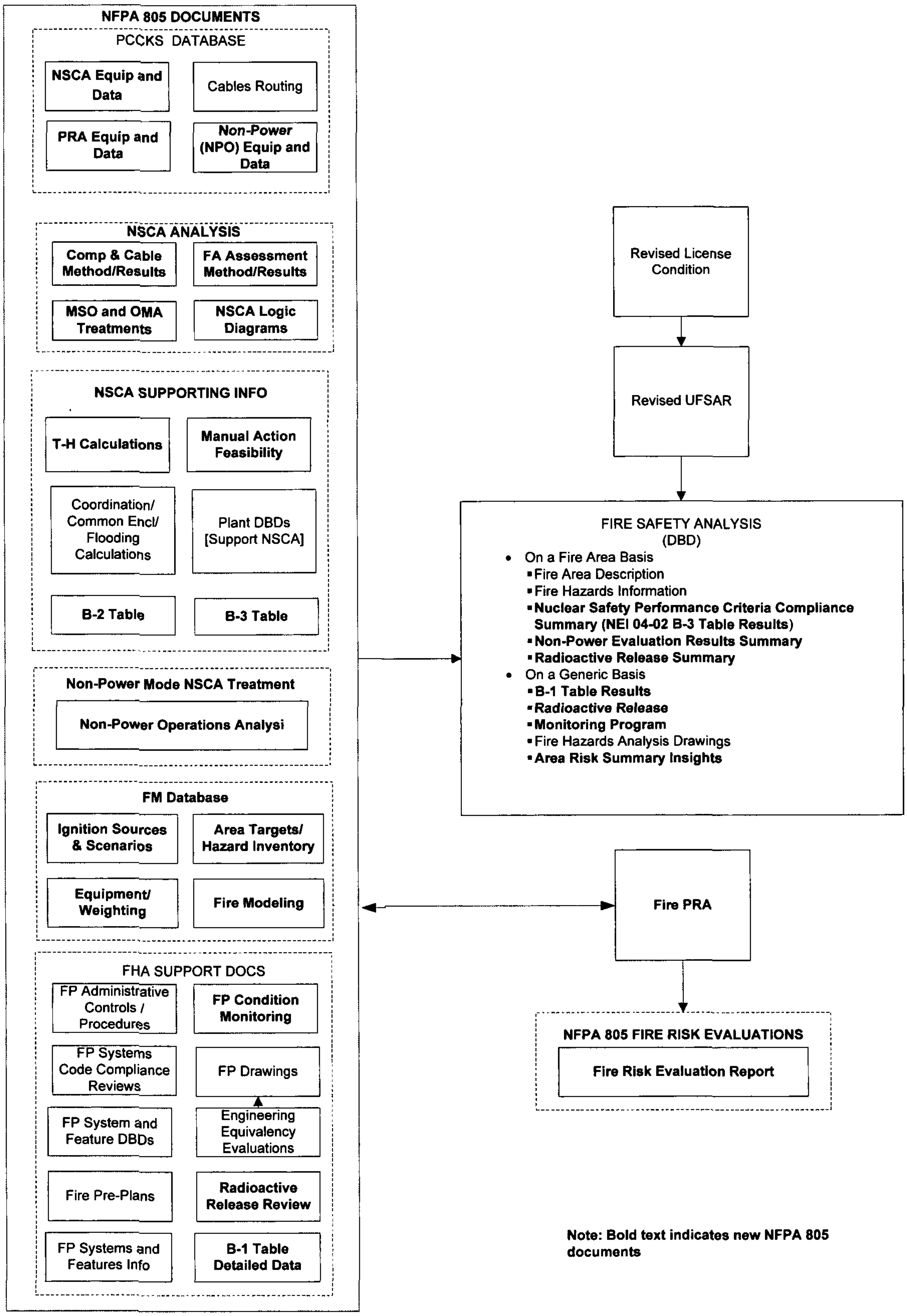

Figure 4-8 NFPA 805 Planned Post-Transition Documents and Relationships

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.

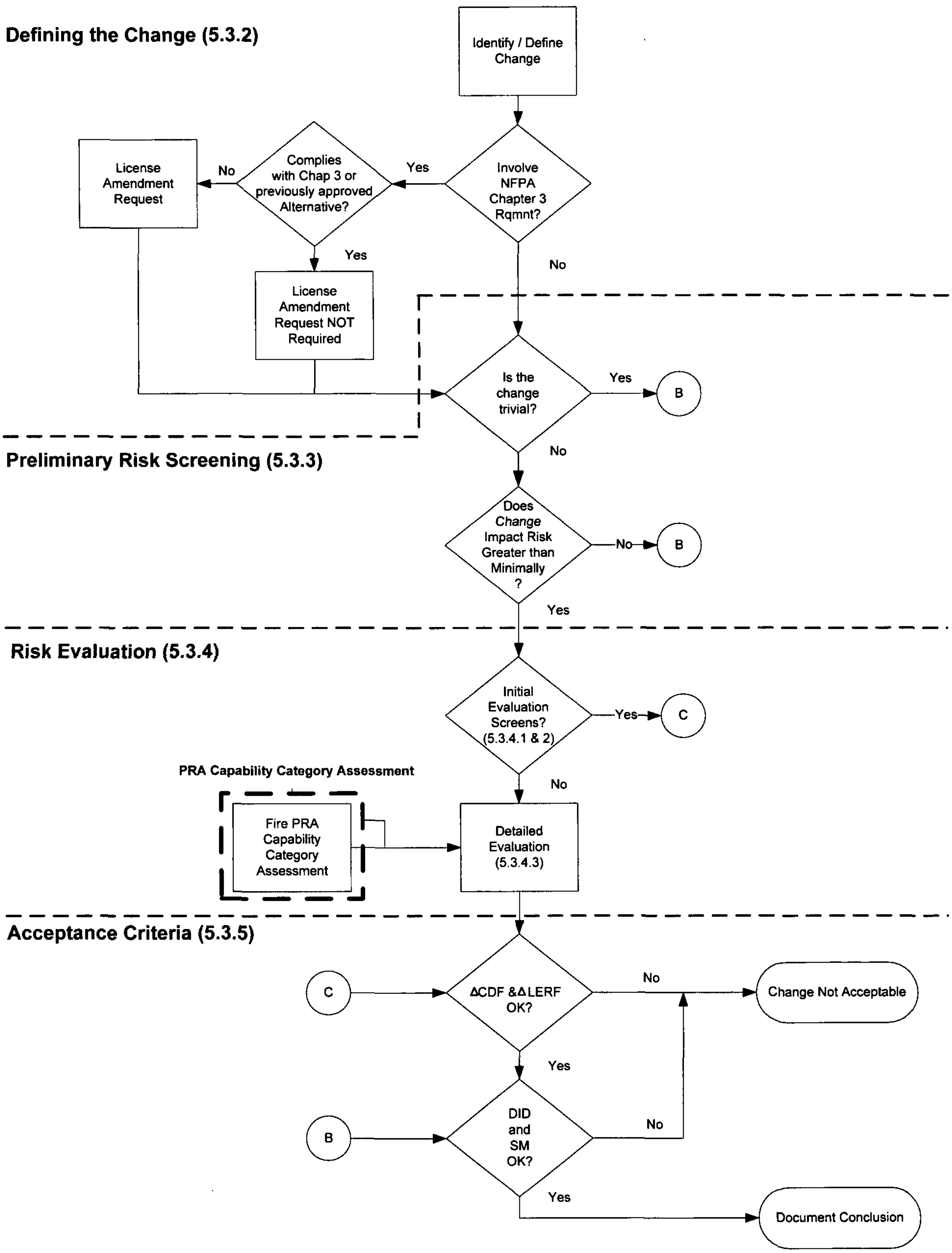

Figure 4-9 Plant Change Evaluation [NEI 04-02 Figure 5-1]
Note references in Figure refer to NEI 04-02 Sections

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 NSCA	Required Performance-Based	Required Engineering Evaluation	Comments / References
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 NSCA	Required Performance-Based	Required Engineering Evaluation	Comments / References
	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			Comments / References
				NSCA	Performance-Based	Engineering Evaluation	
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			Comments / References
				NSCA	Performance-Based	Engineering Evaluation	
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 NSCA	Required Performance-Based	Required Engineering Evaluation	Comments / References
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 NSCA	Required Performance-Based	Required Engineering Evaluation	Comments / References
	-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 NSCA	Required Performance-Based	Required Engineering Evaluation	Comments / References
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			Comments / References
		NSCA	Performance-Based	Engineering Evaluation	
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			Comments / References
		NSCA	Performance-Based	Engineering Evaluation	
					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)

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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.

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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.

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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)

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

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

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.

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

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

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

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

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

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

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

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

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

Section	Section Description	Disposition	Reference Document	Results Summary
	NEI 04-02 Table B-1 Transition of Fundamental Fire Protection Program & Design Elements			
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.

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

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/ChargingRCS 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 (includingAbnormal 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 Path Including Equipment That May Spuriously Operate and Affect System Operation	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 operationof 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

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

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 combinationof 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

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

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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 thefollowing 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

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

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

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

C. NEI 04-02 Table B-3 Fire Area Transition

471 Pages Attached

Fire Area Transition

The NSCA provides an evaluation for each fire area at VCSNS to verify that the nuclear safety goals are met. The nuclear safety performance criteria include: Reactivity Control, Inventory and Pressure Control, Decay Heat Removal, Instrumentation, and Support System operability. The overall NFPA 805 analysis process includes: 1. Identifying equipment needed for safe shutdown, and relevant support equipment, 2. Identifying the cables for this equipment, 3. Locating the fire areas for the cables, 4. Evaluation of the effects of postulated fires in a given fire area, and 5. Resolving open items to ensure the capability to reach and maintain safe shutdown. The NSCA covers items 4 and 5, evaluation and resolution of safe shutdown capability for each fire area.

As previously described, the basic analysis consists of the following steps: 1. Identification of systems and equipment needed to achieve the nuclear safety performance criteria, 2. Selection of cables needed to achieve the nuclear safety criteria, 3. Location and routing of these cables, and 4. Assessment of the ability to achieve the nuclear safety criteria given a fire in each fire area. Steps 1 through 3 are the NSEL, circuit analysis, and routing information described in VCSNS Technical Report TR08620-015, "Nuclear Safety Equipment Report," Project Instruction 4.4, "Cable Selection and Circuit Analysis," Technical Report TR07800-009, "NFPA 805 and Fire PRA Circuit Analysis," and the PC-CKS database. The analysis of the fire areas (item 4) utilizes the computer codes CAFTA and ARC.

The Fire Area analysis may be subdivided into zones and subzones to facilitate the analysis of the ability to achieve safe shutdown. In particular, where train separation (20 ft horizontal separation plus suppression and detection) was credited, the fire area was divided into zones (and if necessary, subzones). Controls to preclude transient combustibles and engineering analyses support the zone and subzone designations. For this evaluation several zones/subzones were combined in the Auxiliary Building to create eight (8) Scenario Areas separated by 3-hour walls. The new Scenario Areas entailed a review of the 20 foot separation for the combined zones to assure that separation was retained. The Table B-3 for the Auxiliary Building includes these Scenario Area descriptions. There were also zone/subzone combinations analyzed for the Reactor Building and part of the Intermediate Building. Again, the purpose of the zone/subzone designation is to assure that 20 foot physical separation is provided to help assure Train separation.

The CAFTA provides a logic model of the plant equipment. The CAFTA tree is set up to determine whether the safety goals are satisfied, and connects the functional states of the equipment in the NSEL in a way that represents the plant configuration. In general, there are multiple paths available to achieve a goal, the CAFTA tree connects these paths as the piping and electrical systems are configured.

The ARC Software identifies the equipment and cables in a given fire area and uses the CAFTA model to check whether the safety goal is achieved. If the goals identified on the ARC button panel are achieved, the button is green, if not, the button is red. The program allows the application of "corrective actions" to achieve success, which are maintained and tabulated for each type and fire area.

Identification and resolution of open items is integral with the analysis process. The corrective actions needed to achieve the safety goals may include cable rerouting, Electrical Raceway Fire Barrier Systems (ERFBS), equipment modification, and other techniques. These are identified individually in ARC. The information is exported from ARC and given a unique DROID number. DROIDs that are resolved deterministically retain their DROID tracking and are also tracked with an appropriate process, such as an ECR number. DROIDs that are not amenable to a deterministic resolution are identified with a VFDR number and are described in the B-3 Table. Finally, the input information needed to perform the NSCA, and the salient output and resolution tracking are entered into the FSA database. The FSA database provides information that will be reviewed for future plant modifications. This will help assure that equipment and assumptions associated with this analysis are maintained and appropriately considered.

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