Progress Energy

AUG 13 2009

Christopher L. Burton
Vice President
Harris Nuclear Plant
Progress Energy Carolinas, Inc.

Serial: HNP-09-084
10 CFR 50.90

U. S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, D.C. 20555-0001

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT 1
DOCKET NO. 50-400/RENEWED LICENSE NO. NPF-63
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST TO ADOPT NATIONAL FIRE PROTECTION ASSOCIATION STANDARD 805, "PERFORMANCE-BASED STANDARD FOR FIRE PROTECTION FOR LIGHT WATER REACTOR GENERATING PLANTS" (TAC NO. MD8807)

References:

1. Letter from R. J. Duncan to the Nuclear Regulatory Commission (Serial: HNP-08-061), "Request for License Amendment to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants (2001 Edition)," dated May 29, 2008

2. Letter from C. L. Burton to the Nuclear Regulatory Commission (Serial: HNP-08-113), "Supplement to Request for License Amendment to Adopt NFPA 805 Performance-Based Standards for Fire Protection for Light Water Reactor Generating Plants (2001 Edition)," dated November 14, 2008

3. Letter from K. A. Harshaw to the Nuclear Regulatory Commission (Serial: HNP-08-121), "Supplement 2 to Request for License Amendment to Adopt NFPA 805 Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants (2001 Edition)," dated December 11, 2008

4. Letter from M. Vaaler, Nuclear Regulatory Commission, to C. L. Burton, "Shearon Harris Nuclear Power Plant, Unit 1 – Request for Additional Information Regarding License Amendment Request to Adopt National Fire Protection Association Standard 805, 'Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants' (TAC NO MD8807)," dated August 6, 2009

Ladies and Gentlemen:

On August 6, 2009, the Harris Nuclear Plant (HNP) received a request from the NRC (Reference 4) for additional information needed to facilitate the review of the License Amendment Request to Adopt National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants." This original request was submitted as Serial: HNP-08-061 (Reference 1) and supplemented via Serial: HNP-08-113 (Reference 2) and Serial: HNP-08-121 (Reference 3).

P.O. Box 165
New Hill, NC 27562

T> 919.362.2502
F> 919.362.2095

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NRR

Per discussions with Marlayna Vaaler, NRC Project Manager for HNP, HNP's responses to these questions will be provided in three parts. Submittal to the NRC of the requested additional information needed for a portion of the questions is being provided by August 14, 2009, with a second submittal on August 31, 2009. The final responses will be provided in September 2009.

In accordance with 10 CFR 50.91(b), HNP is providing the state of North Carolina with a copy of this response.

This document contains no new or revised regulatory commitments.

Please refer any questions regarding this submittal to Mr. Dave Corlett, Supervisor – Licensing/Regulatory Programs, at (919) 362-3137.

I declare under penalty of perjury that the foregoing is true and correct. Executed on

AUG 13 2009

Sincerely,

Christopher L. Burton
Vice President
Harris Nuclear Plant

CLB/kms

Enclosure 1: Response to Request for Additional Information Regarding License Amendment Request to Adopt NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Generating Plants"

Cc: Mr. J. D. Austin, NRC Sr. Resident Inspector, HNP
Ms. B. O. Hall, N. C. DENR Section Chief
Mr. L. A. Reyes, NRC Regional Administrator, Region II
Ms. M. G. Vaaler, NRC Project Manager, HNP

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The U.S. Nuclear Regulatory Commission (NRC) staff has determined that it needs responses to requests for information in the following areas in order to continue its review of the subject request for the Shearon Harris Nuclear Power Plant, Unit 1 (HNP or Harris):

1. Programmatic Elements Related to the License Amendment Request (LAR)
2. Fundamental Fire Protection Program and Minimum Design Requirements
3. Meeting the Nuclear Safety Performance Criteria
4. Meeting the Radioactive Release Performance Criteria
5. Risk Assessments and Plant Change Evaluations
6. The NFPA 805 Monitoring Program
7. Program Documentation, Configuration Control and Quality Assurance

1. Please provide the following information relative to LAR programmatic elements:

HNP RAI 1-1

Section 3.1, "Background," of the HNP NFPA 805 Transition Report (Harris Transition Report) does not include any mention of the need to complete the modifications committed to by Carolina Power and Light Company, now doing business as Progress Energy Carolinas, Inc. (PEC or the licensee) as part of its transition to NPFA 805.
Is the completion of any required modifications meant to be included in item "(7) complete implementation of the new licensing basis?" If so, this should be explicitly stated in the discussion since completion of committed modifications is required to complete transition. The licensee should provide a summary of the proposed modifications, a schedule for implementation of those modifications, and a proposed License Condition reflecting the commitment to, and schedule for, installation of the modifications.

Response: Yes, implicit in item (7) of the HNP NFPA 805 Transition Report Section 3.1, "complete implementation of the new licensing basis," is the completion of the identified modifications. This sentence will be revised in the Transition Report to explicitly state this. An update summary of Attachment S, Plant Modifications, will be provided with the August 31, 2009, response.

The schedule for implementation and installation of the identified modifications remains the same as previously presented in Transition Report 5.4.

Attachment M, License Condition Changes, has been updated to reflect this revised license condition.

HNP RAI 1-3

The post-transition use of qualitative performance-based methods (similar to the old Generic Letter (GL) 86-10, "Implementation of Fire Protection Requirements," process) discussed in the

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Harris Transition Report, Attachment P, "Performance-Based Methods – NFPA 805 Chapter 3 – 10 CFR 50.48.(c)(2)(vii)," is based on the approach documented in NFPA 805 Frequently Asked Question (FAQ) 06-0008, "Fire Protection Engineering Evaluations," Revision 5.

However, agreement was reached and a closure memo was approved based on FAQ 06-0008, Revision 9. To obtain the benefit of the approaches documented in FAQ 06-0008, Revision 9, for post-transition qualitative Fire Protection Engineering Evaluations, the LAR should be revised to reference the appropriate revision of FAQ 06-0008.

Response: Paragraph 1 on page P-1 of Attachment P, "Performance-Based Methods – NFPA 805 Chapter 3 – 10 CFR 50.48(c)(2)(vii)," will be revised to reference FAQ 06-0008, Revision 9 (ML073380976).

HNP RAI 1-4

NFPA 805, Section 3.11.5, "Passive Fire Protection Features – Electrical Raceway Fire Barrier Systems (ERFBS)," states:

> *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 should 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.*

The Harris Transition Report, Section 4.8.2.3, "Hemyc and MT Electrical Raceway Fire Barrier Systems," states that specific testing for the Hemyc and MT fire barrier wraps has been completed. It also states that fire barrier worth has been established for the applications of Hemyc and MT that are credited to meet the Nuclear Safety Performance Criteria at HNP.

However, there is no entry in Attachment A to the Harris Transition Report (Table B-1, "Transition of Fundamental Fire Protection (FP) Program and Design Elements (NFPA 805 Chapter 3)," from the Nuclear Energy Institute (NEI) document NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program under 10 CFR 50.48(c)") regarding the Hemyc or MT fire barrier wraps.

Please provide a compliance statement with regard to the requirements in NFPA 805, Section 3.11.5. Include in the compliance basis:

- *A description of the test protocol*
- *The acceptance criteria*
- *Results of the testing with regard to the fire barrier rating*
- *Any limitations or conditions that need to be applied in crediting the Hemyc and/or MT fire barrier wraps as a method for meeting the Nuclear Safety Performance Criteria*

Also, please indicate whether any modifications will be required for the existing fire barrier wraps, whether the existing wraps will be classified as degraded systems until such modifications take place, and describe how configuration control will be maintained in the field.

Response: HNP has updated Section 4.8.2.3 of the LAR to include details on resolution of the Hemyc and MT ERFBS issue. Additionally, the method of compliance HNP utilized to meet the NFPA 805, Section 3.11.5 requirements is as follows:

Hemyc and MT Test Protocol:

Fire testing to support the fire barrier worth assessments of Hemyc and MT ERFBS at HNP was conducted by a nationally recognized testing facility (Intertek Testing Services NA, Inc. – formerly Omega Point Labs) in accordance with Generic Letter 86-10, Supplement 1, following the standard methods of ASTM E 119 for the furnace environment. Formal test reports and results are provided in Test Reports CTP-2010 for MT ERFBS and CTP-2011, 2012 and 2013 for Hemyc ERFBS. These test reports provide the complete test plan and testing protocol along with test results and conclusions.

Hemyc and MT Fire Test Acceptance Criteria:

The test specimens developed as part of the HNP Hemyc and MT ERFBS fire testing and credited testing performed by other industry groups/agencies were subjected to the ASTM E 119 temperature-time profile in the test furnace with thermocouple placement provided as directed in Generic Letter 86-10, Supplement 1. An assessment of the ERFBS performance was based on two of the three principal factors, as stated in Generic Letter 86-10, Supplement 1:

1. The time at which the average unexposed side temperature of the fire barrier system, as measured on the exterior surface of the conduit or component, exceeds 139°C (250°F) above its initial temperature. Or the time at which a single temperature reading of a test specimen exceeds 30% of the maximum allowable temperature rise (i.e., 180°C [325°F]) above its initial temperature.

2. The fire barrier system remains intact during the fire exposure and water hose stream test without developing any openings through which the electrical raceway is visible.

The credited Hemyc and MT ERFBS fire testing did not consider the third criteria presented in Generic Letter 86-10, Supplement 1, regarding cable degradation from the thermal effects of the

fire exposure. The approach utilized was to run the individual fire tests to full test duration so that a failure point for each test configuration could be obtained based on maximum temperature rise for barrier rating purposes. Since the original Hemyc and MT ERFBS installations were employed prior to the issuance of Generic Letter 86-10, Supplement 1, any cable fire damage that may have occurred on some test configurations after the maximum credited time duration is of no significance to the HNP credited ratings and therefore allowed per Exception 2 to NFPA 805, Section 3.11.5.

Hemyc and MT ERFBS Fire Testing Results/Fire Barrier Worth:

The maximum credited fire resistance duration is 27 minutes for Hemyc and 115 minutes for MT. Although several of the test configurations achieved a fire resistance duration greater than these points, these fire resistance durations were used as a bounding criteria. The Fire Barrier Rating evaluations performed in Calculations HNP-M/MECH-1103 and HNP-M/MECH-1104 provide the basis for the existing installations meeting these fire resistance durations "as-is" or with upgrade modifications.

These installations were evaluated by using the NFPA 805 Change Evaluation process referenced in Attachment Y of the LAR/Transition Report.

A full description of the fire test results are provided in each Hemyc and MT ERFBS Rating Calculation (HNP-M/MECH-1103 and 1104).

Upgrade Modifications:

Each installation was surveyed to determine if the configurations were acceptable "as-is" or required upgrade modifications. Typical upgrade modifications involve the following:

- installation of termination collars or pads where the Hemyc and MT ERFBS meets a fire barrier
- installation of larger joint collars on the Hemyc ERFBS installed on conduits
- rework of MT ERFBS on junction boxes to provide adequate blanket overlaps
- addition of insulation blanket to thermal short (support)

Modifications are being performed under two separate Engineering Change packages at HNP (EC 69764 for Hemyc and EC 69765 for MT). This upgrade work will be completed prior to the implementation of the NFPA 805 Program Transition. These modifications are listed in Attachment S as NFPA 805 Transition modifications.

As discussed in the HNP response to NRC Generic Letter (GL) 2006-03, "Potentially Nonconforming Hemyc and MT Fire Barrier Configurations," compensatory measures have been implemented in the form of fire watch patrols and controls on transient combustible materials in the areas with Hemyc and MT ERFBS which are credited with providing protection

for required Safe Shutdown circuits. These compensatory actions will remain until final resolution of this issue via the NFPA 805 Fire Protection Program implementation.

Configuration control of the Hemyc and MT ERFBS installations has been discussed in the response to RAI 2-14.

Attachment A of the HNP NFPA 805 Transition Report will be updated, under a separate response (HNP RAI 2-4 for Attachment A – NEI 04-02 Table B-1 questions) to include information on compliance of Hemyc/MT ERFBS in Section 3.11.5 of Table B-1.

HNP RAI 1-5

Attachment S, "Plant Modifications," of the Harris Transition Report includes the proposed installation of Incipient Fire Detection Systems to monitor incipient fire conditions in certain critical electrical cabinets in several fire areas as a way to reduce fire risk. FAQ 08-0046, "Incipient Fire Detection Systems," was created to address the use of these systems.

The NRC staff has developed an interim position on this FAQ that provides guidance with respect to how Incipient Fire Detection Systems (also called Very Early Warning Fire Detection Systems (VEWFDS)) may be credited in a Fire Probabilistic Risk Assessment (Fire PRA). In accordance with the NRC staff's interim position, there are numerous conditions that must be met for the staff to accept the full numerical credit provided for the installation of VEWFDS.

Regarding the proposed Incipient Fire Detection Systems to be installed at HNP:

a. *When modeling VEWFDS to monitor electrical/electronic cabinets, components that may rapidly degrade, such as electrical/electronic circuit boards that contain electrolytic capacitors, chart recorder drive motors, cooling fan motors, mechanical timers driven by electric motors, etc., should be excluded. Provide a description of the screening process used to inspect cabinets being monitored by the proposed VEWFDS to confirm that components that may degrade rapidly are properly addressed in the model.*

   Response: The VEWFDS will be installed in select low voltage (< 120 VAC/125VDC) instrumentation and control cabinets. Most low voltage (~250 volts or less) electric and electronic components will degrade over a long period of time, with observable telltales that can be sensed by VEWFDS. Examples of these include terminal strips, cables, inter-panel wiring, electro-mechanical relays, transformers, switches, power supplies, amplifiers, bistables, controllers, manual automatic control stations, indicators, gauges, computers (NRC Draft Interim Position FAQ 08-0046). Each cabinet was opened and visually inspected to verify that a VEWFDS was applicable to the potential ignition sources and subsequent treatment in the Fire PRA. The risk analysis includes an event tree that accounts for the possibility that a fraction of the electrical cabinet components may exhibit a short incipient stage prior to flaming combustion.

b. *Based on discussions with the licensee, the proposed VEWFDS at HNP is an aspirated system. For an aspirating system to function properly while monitoring the interior of an electrical/electronic control cabinet, the ventilation characteristics of the cabinet to be monitored must allow for the use of an aspirated VEWFDS (aspirated systems will not function properly in a tightly sealed cabinet). Provide a description of the cabinets to be monitored by the proposed VEWFDS and verify that no cabinets are tightly* sealed.

Response: Each cabinet was opened and visually inspected to ensure that there is adequate ventilation to allow for an aspirated VEWFDS system to function properly. None of the electrical cabinets that will have the system installed are air tight and all of them have ventilation to allow for dissipation of heat from normal operation. There will be proper functionality of the aspirated VEWFDS in the proposed cabinets.

c. *FAQ 08-0046 references Electric Power Research Institute (EPRI) document 1016735, "Fire PRA Methods Enhancements: Additions, Clarifications, and Refinements to EPRI 1011989," which includes a discussion on system availability and reliability of VEWFDS. EPRI 1016735 primarily has information on cloud chamber and laser aspirating detection systems. Provide a statement that the system being proposed for HNP is sufficiently similar to those described in EPRI 1016735 that the availability and reliability numbers provided in that document are also applicable for use at Harris.*

Response: The VEWFDS that is being designed for use at HNP was chosen in part because it has the longest operating history as identified in EPRI 1016735. The system is from the same OEM as the referenced cloud chamber technology systems in the EPRI report and the OEM provided system reliability is consistent with EPRI 1016735.

d. *Provide the following information related to the design, installation, and testing of the proposed VEWFDS at HNP:*

1) *What is the NFPA code of record (NFPA 76, "Standard for the Fire Protection of Telecommunications Facilities," NFPA 72, "National Fire Alarm Code," or other)?*

Response: The code of record, which is being used in the development of Engineering Change, EC- 69501, is NFPA 72. The appropriate sections of NFPA 76 are being used for guidance to ensure that the VEWFDS meets the performance goals for proper credit in the Fire PRA.

2) *What training and qualification requirements will the installation technicians have to meet? Will the installation be performed by vendor certified technicians?*

Response: Training and qualification of installation technicians associated with the installation of VEWFDS at HNP will be in accordance with applicable HNP procedures for the conduct of maintenance and construction activities. Training requirements will be finalized and documented during the Engineering Change Process. Vendor support when provided will be in accordance with

applicable NGG material and contract service procedures in place, and under the direction of the licensee.

3) *What installation testing will be performed and to what standard?*

Response: Installation and testing will be in conformance with HNP's EC process and will be performed to both NFPA 72 and the OEM requirements.

4) *With regard to system sensitivity, how will the initial system Alert and Alarm settings be established? What steps will be taken to avoid spurious/nuisance alarms? After commissioning the VEWFDS, how will system Alert and Alarm setpoint changes be controlled?*

Response: Initial system Alert and Alarm setting will be determined for each detection zone as part of the installation/pre-operational testing based on ambient conditions present. Guidance from applicable NFPA and OEM associated with settings for alert and alarm obscuration levels will be utilized, and will be specified in EC-69501 for installation. Following installation, these Alert and Alarm settings (set-points) will be maintained under the established plant configuration control process.

5) *What regular and preventive maintenance will be required for the VEWFDS?*

Response: Regular and preventative maintenance will be in accordance with OEM, NFPA 72, and HNP's preventative maintenance program. The VEWFDS design includes a continuously monitored Trouble annunciator, on the MCB, consisting of a circuit supervisory signal for faults in the detector(s), or a failure of one of the system modules. Any detector or system fault condition would be annunciated, investigated immediately, and appropriate compensatory measures implemented until the fault condition is corrected. In addition to the continuously monitored supervisory Trouble indication, the VEWFDS will receive quarterly surveillance testing and annual maintenance as recommended by the OEM.

6) *How often does the proposed VEWFDS require calibration?*

Response: The VEWFDS will be installed and calibrated according to OEM requirements. Regular NFPA 72 testing, OEM recommended maintenance and HNP preventative maintenance will ensure that the system is maintained and calibrated to respond to fire events appropriately. The manufacturer recommended maintenance and calibration will be incorporated into the PM program during the Engineering Change process.

7) *Provide a description of the operator interface with the VEWFDS. How will Alerts and Alarms be annunciated, where will they be annunciated, and who will respond to the Alerts and Alarms?*

Response: The VEWFDS Fire Alarm Control Panel (FACP) will be connected to an Annunciator Window Box on the Main Control Panel in the Main Control Room to annunciate "trouble", "alert" and "alarm" conditions on individual windows. Control Room Operators will respond to these indications in accordance with plant operating procedures.

8) *Describe the configuration controls to be placed on the maintenance, preventive maintenance, and testing procedures for the proposed VEWFDS.*

Response: PM/testing of the VEWFDS will become part of the plant surveillance program, and subject to all requirements of the program. Any changes to the established PM/testing requirements must be processed through the HNP Configuration and Design Control process which includes Fire Protection engineer review.

e. *Provide a detailed description of the VEWFDS response procedure. What qualifications will be required for the initial responders?*

Response: Response to VEWFDS Alert and Alarm indications will be initiated by plant operators based upon annunciation in the Main Control Room (reference above response to RAI 1-5 d.7 above). Qualified on-shift Operations and/or Maintenance will respond to investigate Alert and Alarm indications without delay and will provide continuous attendance of the affected area until the condition is resolved. Additional indication of a fire will initiate response by the site fire brigade.

f. *Describe the process used to establish the human error probability (HEP) of a successful operator response to a VEWFDS Alert.*

Response: The probability of this event is a function of the plant procedures and training. The expectations for VEWFDS alarm response are consistent with other fire detection systems credited in NUREG/CR-6850 with a potentially negligible probability of failure to respond. A probability of 1E-03 is being applied to the event tree analysis as a screening value. A sensitivity analysis of the VEWFDS treatment in the Fire PRA is being conducted and will be included in a separate RAI response submittal.

g. *Provide a description of the process that will be used to assure that VEWFDS Alerts and Alarms are responded to properly. Will the VEWFDS be included in the fire brigade training and drill process?*

Response: VEWFDS Alert and Alarm response will follow guidance provided in an Annunciator Panel Procedure (APP) developed as part of EC-69501, Design and

Installation of Incipient Detection for NFPA 805. Review for inclusion of response actions into the applicable training program(s) is part of the EC process, which will include fire brigade training and drills as appropriate.

h. *Upon locating the associated cabinet during a VEWFDS Alert, describe the process that will be used to locate the degrading component/sub-component and mitigate the potential fire.*

Response: The VEWFDS will indicate an addressable alert signal that will identify a specific zone (bank of cabinets) that has a degrading component. The responding personnel will immediately utilize a portable VEWFDS locating device to isolate the search to one cabinet (in a zone) and a specific area within that source cabinet. The source cabinet will be continually monitored while the alert condition is investigated. In addition to the portable locating device, thermal imaging cameras may be used to assist the location of a hot spot and identify the cause of the alarm. The cabinet will be under a continuous fire watch until the degrading component is repaired, the cabinet is de-energized, or the Alarm is satisfactorily reset.

i. *Describe the tools and equipment required to locate the source of a VEWFDS Alert. Describe any controls that will be placed on the required tools and equipment.*

Response: Response by on-shift personnel during investigation of VEWFDS Alert or Alarm indications may include utilization of Incipient Fire Detection Pro-Locator (OEM name) Portable Detection Device to locate specific cabinet and internal component providing pre-ignition indication and/or use of thermal imaging equipment as necessary. The Pro-Locator device will be provided for use by on-shift personnel as part of the EC-69501 modification. Regular scheduled surveillance and PM will ensure that Pro-Locator equipment is available and functional at all times. Thermal Imaging Camera (TIC) equipment is maintained and available for use as a part of the existing plant fire brigade equipment and tools compliment.

j. *Describe the process that will be used to control the VEWFDS set point(s).*

Response: Any change to the VEWFDS setpoint(s) will be processed through the HNP Configuration and Design Control process, requiring an engineering review before alteration of a setpoint.

k. *On what periodicity will the system effectiveness be assessed with respect to the values assumed in the Fire PRA?*

Response: The VEWFDS performance will be assessed during the regular schedule surveillance and maintenance activities in accordance with the OEM recommended schedule and NFPA 72 required recurring testing.

l. *Describe how the plant monitoring program will maintain the VEWFDS within the Fire PRA-assumed values.*

Response: A monitoring program will be established to assess the performance of the fire protection program in meeting the performance criteria established in NFPA 805. The VEWFDS has been assigned an individual performance maintenance group (PMG) in the monitoring program to ensure that the VEWFDS will maintain a level of performance consistent with what is assumed in the Fire PRA. Establishment of the PMG criteria will be completed as part of program implementation (see LAR section 4.6 for NFPA 805 Monitoring).

m. *Describe the compensatory measures required to be established if the VEWFDS is out of service. How will these compensatory measures be controlled?*

Response: A fire watch will be maintained at the affected cabinets during the out of service time for any VEWFDS fire detection zone. Compensatory measures will be specified and controlled in plant procedures.

HNP RAI 1-6

NEI 04-02, Revision 2, Section B.3.2, "Submittal of Existing Engineering Equivalency Evaluations [EEEEs] in License Amendment Request," states that those EEEEs that demonstrate a fire protection system or feature is adequate for the hazard should be summarized in the LAR documentation. NEI 04-02, Revision 2, is currently undergoing NRC staff review for endorsement in Revision 1 of Regulatory Guide (RG) 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants."

The NRC's current position on this issue is as follows:

- *Licensees not requesting specific approval for their adequate for the hazard EEEEs should state that an EEEE has been used to demonstrate compliance, and provide a description of each deviation in the appropriate submittal entries. The staff may then request more detailed information for review during an audit and/or the RAI process.*

- *Licensees requesting specific NRC approval for their performance-based, adequate for the hazard EEEEs should, in addition, submit a summary for each EEEE that will include sufficient detail to allow for evaluation of the EEEE. At a minimum, this level of detail is expected to include: a) a summary of the deviation; b) a summary of the evaluation of each deviation; and c) a summary of the resolution of each deviation.*

- *In all cases, licensees that rely on the use of EEEEs for compliance with NFPA 805 requirements should correctly document this usage in their submittal.*

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In Enclosure 2 of the licensee's November 14, 2008, supplement, HNP requests specific NRC approval for the transition of their performance-based, adequate for the hazard EEEEs, the results of which are contained in Attachment J, "Existing Engineering Equivalency Evaluation Transition," of the Harris Transition Report.

However, in general, there is insufficient detail provided with each evaluation for the NRC staff to correctly assess them. For each EEEE, provide a more detailed summary, including:

- *A summary of the condition/deviation*
- *A summary of the evaluation of each condition/deviation*
- *A summary of the resolution of each condition/deviation*

Conversely, if the licensee wishes to no longer request specific NRC approval to transition the EEEEs, the LAR should be revised accordingly. In either case, HNP should correctly document the usage of EEEEs to establish compliance with the NFPA 805 requirements. This includes providing a description of the evaluated deviation(s) in the appropriate Table B-1, "Transition of Fundamental FP Program and Design Elements," and Table B-3, "Fire Area Transition," entries.

Response: The scope of the Engineering Equivalency Evaluations (EEEs) required to be included in the LAR has changed since HNP submitted the LAR. Figure 1 below depicts the timeline and bases for this conclusion.

FAQ 06-0008, NFPA Fire Protection Engineering Evaluation, Revision 9, as endorsed by the NRC in the closure memo dated March 12, 2009 (ML073380976), provides guidance on treatment of engineering evaluations. FAQ 06-0008 concludes that functional equivalency evaluations for all section of NFPA 805 Chapter 3 and "adequate for the hazard" analyses for sections 3.8, 3.9, 3.10, and 3.11 of NFPA 805 are allowed and do not require NRC approval following transition to NFPA 805. Since NRC approval is not required for these types of evaluations following transition, it is proposed that these evaluations do not need to be summarized/included in the LAR. This concept has been discussed with NRC staff members at Pilot Plant RAI meetings and in a meeting with the NEI 04-02 Writing Team after the initial HNP RAIs were developed. This supersedes the summary in the closure memo for FAQ 07-0033 in the closure memo dated August 28, 2008 (ML082380395), which indicates that adequate for the hazard evaluations must be summarized in the licensee's transition submittals.

FAQ 07-0033, Transition of Existing Engineering Equivalency Evaluations, Revision 1, as endorsed by the NRC (ML082380395), provides guidance to licensees to review engineering evaluations included in their new licensing bases for appropriateness, quality, applicability to the current configuration, and compliance with their existing (pre-transition) licensing basis. HNP has reviewed all engineering evaluations referenced in Table B-1 to the criteria set forth in FAQ 07-0033, Revision 1, and determined that those engineering evaluations are acceptable for transition.

HNP's treatment of the NFPA Code Compliance calculations referenced in the B-1 Table follows a similar process as that used for EEEE's, as will be detailed in HNP's August 31, 2009, response to RAI 2-5. For evaluations of HNP's compliance with NFPA standards as referenced in Table B-1, HNP will review the NFPA code compliance engineering evaluations against the requirements of FAQ 07-0033 when the evaluations are completed. These evaluations are referenced in a revised Table B-1 by calculation number and the calculations (code compliance evaluations) are available for NRC review.

HNP will revise the Transition Report and Attachment J – EEEE Transition to remove all Engineering Evaluations currently listed. The engineering evaluations currently listed in Attachment J are allowed and do not need to be submitted in the LAR for NRC approval.

2. Please provide the following information regarding the fundamental fire protection program and the minimum design requirements:

HNP RAI 2-1

Item (3) of NFPA 805, Section 3.2.3, "Fire Protection Plan – Procedures," requires reviews of fire protection program related performance and trends. Please describe how compliance to Section 3.2.3 (3) will be achieved at HNP.

Response: The NFPA 805 requirement for reviews of program related performance and trending is provided under the NFPA 805 Monitoring program as described in LAR section 4.6, Monitoring, and Attachment R, FSAR Changes. Specific criteria are still being developed under the guidance in Project Instruction FPIP-0130. This guidance is to be incorporated into fleet procedure FIR-NGGC-0130 at the end of the transition.

HNP RAI 2-3

During the audit of the HNP NFPA 805 transition program, apparent discrepancies were identified between the areas being designated as within the power block per Attachment I, "Definition of Power Block," of the Harris Transition Report, and those contained in HNP site procedure FPP-001. Has FPP-001 been updated to reflect the newer designations cited in Attachment I of the Harris Transition Report? If not, please provide a description of the changes that will be made to address the new areas to be considered within the power block.

Response: The "Power Block" structures for HNP are identified in Attachment I of the HNP LAR. Application of these defined areas to aspects of FPP-001, Fire Protection Program Manual and associated implementing procedures will be accomplished under EC-67999, NFPA 805 Implementation, and will be completed as described in LAR section 5.4, Transition Implementation Schedule.

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HNP RAI 2-6

Where the NRC has specifically not endorsed sections of text in NFPA 805, this text will not be acceptable as part of any licensee's licensing basis. HNP should not reproduce this specifically not endorsed text in the B-1 Table. Two examples of this from NFPA 805 Chapter 3 are the exception in Section 3.3.5.3, "Prevention – Electrical," and the exception in Section 3.6.4, "Standpipe and Hose Stations." Please ensure that this excluded text does not appear in the B-1 Table of the HNP LAR.

Response: The text from NFPA 805, Chapter 3 Sections 3.3.5.3 and 3.6.4 exceptions that was not endorsed under 10 CFR 50.48(c), c.2.v & vi, have been removed from the tTool database used to produce Table B-1, Attachment A to the HNP LAR/TR. This will be reflected in the revised B-1 Table, to be submitted in HNP's August 31, 2009, response.

HNP RAI 2-14

Section 4.8.2.3, "Hemyc and MT Electrical Raceway Fire Barrier Systems," of the Harris Transition Report describes HNP's use of Hemyc and MT Electrical Raceway Fire Barrier Systems (ERFBS). This section contains a description of HNP's planned resolution for their remaining identified Hemyc/MT issues. As a result of the resolution, some of the installed Hemyc/MT fire barrier systems will no longer be credited to meet the Nuclear Safety Performance Criteria of NFPA 805 Chapter 4, and will subsequently be abandoned in place.

Please describe how HNP will maintain configuration control between those Hemyc/MT installations that will be abandoned in place and those Hemyc/MT installations that will continue to be maintained. Additionally, please ensure that HNP's compliance with respect to the credited Hemyc/MT installations is correctly documented in the HNP B-1 and B-3 Tables, as well as other appropriate locations within the NFPA 805 submittal.

Response: Configuration control of the Hemyc and MT ERFBS at HNP will be provided via the plant controlled document process; specifically ENG-NGGC-0017, Preparation and Control of Design Analyses and Calculations.

The evaluation of the fire barrier worth (credited fire resistance rating) of the originally installed Hemyc and MT ERFBS was performed through the use of a design calculation document. Within each calculation (Calculation HNP-M/MECH-1103, Hemyc ERFBS Rating Calculation and Calculation HNP-M/MECH-1104, MT ERFBS Rating Calculation) there is a table providing a determination on whether the installation of ERFBS on specific electrical raceway is credited in the NFPA 805 Fire Protection Program. The basis for the ERFBS being credited originates in the Fire Safe Shutdown Program Management Document (FSSPMD) and is summarized in a NFPA 805 Transition Project Change Package document referenced in each ERFBS Rating Calculation.

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The summary tables in the Change Package and ERFBS Rating Calculation provide specific detail for each existing ERFBS configuration, identified by electrical raceway as to whether the ERFBS is credited or not. These summary tables will provide the configuration control for the credited ERFBS. Any changes in the NFPA 805, Chapter 4 requirements that could alter the "crediting" of existing Hemyc or MT ERFBS will be controlled under ERG-NGGC-0017 in the future. Changes to FSSPMD which impact the credited ERFBS will require revision of the summary tables provided in Change Packages HNP-0095 and HNP-0096 and the ERFBS Rating Calculations. If an existing ERFBS installation is not credited, the summary tables identify if the specific raceway is wrapped with ERFBS as a single raceway or as part of a multi-raceway wrap system. It then identifies whether the ERFBS must remain or can be removed. These summary tables will provide the future configuration control for HNP personnel to determine the requirement for the Hemyc and MT ERFBS.

As noted in the LAR, there will be existing Hemyc and MT ERFBS installations that are no longer "credited." Some of these installations will be removed and some will be abandoned-in-place. Those that are left "abandoned-in-place" will be controlled via HNP Procedure ENP-114, Long-Term Shutdown and Abandonment of Plant Equipment.

Credited Hemyc/MT installations will be documented in NFPA 805 Transition Report, Table B-1, Section 3.11.5, as well as in individual fire area discussions in the NFPA 805 Transition Report, Table B-3, Fire Area Transition document.

Additional discussion on the Hemyc/MT ERFBS utilized at HNP can be found in the HNP RAI 1-4 response.

3. Please provide the following information concerning meeting the nuclear safety performance criteria:

HNP RAI 3-1

The discussion of non-power operational (NPO) modes included in Section 4.3, "Non-Power Operational Modes," of the Harris Transition Report states that it is based on NFPA 805 FAQ 07-0040, "Non-Power Operations Clarifications," without citing a revision number.

FAQ 07-0040, Revision 4, has been closed by the NRC staff. However, the information in Section 4.3 of the Harris Transition Report does not appear to be entirely consistent with the closed version of FAQ 07-0040. Please provide justification for any deviations from FAQ 07-0040, Revision 4, that were included in the discussion of NPO modes.

Response: The text in Section 4.3 of the HNP NFPA 805 Transition Report, submitted November 14, 2008, is based upon Revision 4 of FAQ 07-0040 that was closed by the NRC on

August 11, 2008, prior to the submittal of the LAR. Since Section 4.3 is essentially a verbatim copy of Revision 4 of FAQ 07-0040, there are no contradictions or deviations between what was stated in the LAR and the process utilized to evaluate the potential effects of a fire during non-power modes of operation as described in FAQ 07-0040.

Section 4.3 will be revised to include specific reference to Revision 4 of FAQ 07-0040 that was used during the HNP NPO modes review.

HNP RAI 3-6

In accordance with the method described in NEI 04-02, Appendix B, Section B.2, "Transition of Nuclear Safety Performance Criteria," as endorsed by RG 1.205, the nuclear safety capability assessment should be compared against the methodology provided in NEI 00-01, "Guidance for Post-Fire Safe Shutdown Analysis," Revision 1.

However, in Table B-2, "Nuclear Safety Capability Assessment," of the Harris Transition Report, the Alignment Basis statement for the first entry in the table ("Deterministic Methodology") references NUREG-0800 and not NEI 00-01. Please describe how the method used to perform the nuclear safety performance analyses for HNP compares to the statement(s) from NEI 00-01.

Response: This is an introductory paragraph containing a generic discussion, and the specific guidelines are discussed in the sections that follow. Except as noted in those sections, the plant's methodology used in the re-analysis meets the guidelines of NEI 00-01. See the specific response to Section 3.4 and the subsequent sections concerning the fire area compliance assessments. During the re-analysis, the NEI 00-01 methodology was one of the references used to develop the system and equipment selection, cable selection and circuit analysis methodology. NEI-00-01 is referenced in FIR-NGGC-0101.

Attachment B of the Transition Report will be updated to reflect this clarification.

A second paragraph has been added to the Alignment Basis in Section 3, "Deterministic Methodology," of Attachment B, B-2 Table, as follows:

> For the re-validation of the SSA performed prior to and in conjunction with the transition process, NEI 00-01, Revision 1 was one of the references used in developing the circuit analysis procedure, which is now captured in FIR-NGGC-0101, revision 0. Except as noted in this document, the plant's methodology meets the guidelines of NEI 00-01. FIR-NGGC-0101, rev. 0, Section 2.0 is also added as a reference.

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HNP RAI 3-7

On page B-3 of the HNP B-2 Table (entry "3.1 [Introduction] – Safe Shutdown Systems and Path Development"), the second paragraph of the Alignment Basis statement references Section 4.2.1.2, "Results from Evaluation Process," of the Harris Transition Report.

However, that section of the Harris Transition Report does not discuss cold shutdown. Please provide either a valid reference for where the topic of cold shutdown is addressed in the Harris Transition Report, or provide a discussion of the proposed end state commitment for the NFPA 805 program with respect to the requirement to demonstrate the ability to maintain the fuel in a safe and stable condition.

Response: Inclusion of this information was not meant to imply that cold shutdown was the required end state in all cases. As stated in NFPA 805, the required end state is safe and stable, which is met when the plant is in a stable hot standby configuration.

The Deterministic Analysis and the procedures provide instructions to guide the operators to Cold Shutdown. However, the PSA end states are not always cold shutdown. This is not necessarily inconsistent since HNP will now use all available Emergency Operating Procedures (EOPs) rather than just the Safe Shutdown Procedures. As evidenced by the EOPs maintaining the plant above 200°F to provide an available secondary heat sink, the EOPs do not always lead to an end state of Cold Shutdown.

During transition, HNP did not attempt to change the safe shutdown analysis to remove equipment/cables (and compliance strategies) that were only required to achieve and maintain cold shutdown. However, as allowed by the NFPA 805 change process and the revised license condition, HNP may revise these strategies post-transition. Section 4.2.1.2 of the Transition Report will be updated to reflect this clarification.

HNP RAI 3-8

On page B-16 of the HNP B-2 Table (entry "3.1.1.9 – 72 Hour Coping"), the NEI 00-01 guidance deals with the 10 CFR Part 50, Appendix R, "Fire Protection Program for Nuclear Power Facilities Operating Prior to January 1, 1979," requirement to maintain the ability to repair at least one train of cold shutdown equipment within the 72 hour coping period established by the post-fire safe shutdown (SSD) analysis.

By including this requirement in the HNP B-2 Table without an associated detailed explanation does the licensee plan to carry this analysis requirement forward as-is?

Additionally, under NFPA 805 requirements, does the licensee need to be able to cool the plant down to cold shutdown conditions in order to meet the nuclear safety performance criteria?

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Each fire area listed in the Harris Transition Report includes a discussion of the equipment necessary to achieve cold shutdown. Does the inclusion of this equipment and the associated discussion imply that cooldown to cold shutdown is the required end state for these fire areas? Does HNP have any repairs that are being transitioned to recovery actions in order to be able to achieve cold shutdown? If so, please provide an appropriate discussion within the LAR.

Response: Reference response to HNP RAI 3-7, above. Inclusion of this information was not meant to imply that cold shutdown was the required end state in all cases. As stated in NFPA 805, the required end state is safe and stable, which is met when the plant is in a stable hot standby configuration.

The Deterministic Analysis and the procedures provide instructions to guide the operators to Cold Shutdown. However, the PSA end states are not always cold shutdown. This is not necessarily inconsistent since HNP will now use all available Emergency Operating Procedures (EOPs), and not just the Safe Shutdown Procedures. As evidenced by the EOPs maintaining the plant above 200°F to provide an available secondary heat sink, the EOPs do not always lead to an end state of Cold Shutdown.

During transition, HNP did not attempt to change the safe shutdown analysis to remove equipment/cables (and compliance strategies) that were only required to achieve and maintain cold shutdown.

However, as allowed by the NFPA 805 change process and the revised license condition, HNP may revise these strategies post-transition.

HNP RAI 3-9

On page B-3 of the HNP B-2 Table (entry "3.1 [Introduction] – Safe Shutdown Systems and Path Development"), the Alignment Basis discussion does not provide any information regarding how the requirement for identification of systems available and necessary to perform the required safe shutdown functions is being met by the associated reference(s). Although several references are provided, there is no discussion of how the process used at HNP compares to the appropriate SSD excerpt from NEI 00-01. Please revise this element of the HNP B-2 Table to incorporate a description of the systems and equipment selection process used at HNP.

Response: This is an introductory paragraph and does not contain any specific guidance. The specific guidance and references to the applicable HNP documents are provided in the applicable sections that follow. Except as noted in those sections, the plant's methodology used in the re-analysis meets the guidelines of NEI 00-01. See the specific responses to sections 3.1.3.1, 3.2.2.1, and 3.2.2.2.

This section of Attachment B of the Transition Report will be updated to clearly state that, except as specifically noted, the HNP methodology is in alliance with that provided in NEI 00-01.

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The following middle paragraph will be added to the Alignment Basis Statement of Section 3.1 [Introduction] – Safe Shutdown Systems and Path Development in Attachment B, B-2 Table:

> "Note that this is an introductory paragraph and does not contain any specific guidance. The specific guidance, and references to the applicable HNP documents, is provided in these subsequent sections. Except as specifically noted below, the HNP methodology aligns with that provided in NEI 00-01."

HNP RAI 3-10

On page B-6 of the HNP B-2 Table (entry "3.1 [Spurious Operations] – Safe Shutdown Systems and Path Development"), the Alignment Basis statement addresses the three types of associated circuits with the potential for spurious equipment operation and/or loss of power source, as discussed in GL 81-12, "Fire Protection Rule." However, there is no associated discussion on how the high/low pressure interface boundaries are addressed in the HNP SSD analysis. Please discuss whether high/low pressure interface valves were considered in the HNP SSD analysis, and if so, how were they incorporated?

HNP RAI 3-11

Attachment H, "NEI 04-02 Frequently Asked Question – Summary Table," of the Harris Transition Report lists NFPA 805 FAQ 06-0006, "High/Low Pressure Interface Definition and NEI 00-01/NFPA 805 Discrepancies," as one of the FAQs used during the development of the HNP NFPA 805 transition process. However, there was no discussion of FAQ 06-0006 in the HNP B-2 Table. If this FAQ was indeed utilized as guidance during performance of the nuclear safety performance assessment, please provide a discussion explaining how it was applied.

Response (3-10 and 11): HNP-E/ELEC-0001, Rev. 3, Section B.5.1.2, Item 21 states: High-low pressure (HLP) interface valves isolate the reactor coolant system from low pressure systems such as RHR. Specifically, such isolation valves are designated HLP interface valves if their spurious operation could lead to the rupture of the low pressure piping and a loss of RCS inventory that exceeds the RCS makeup capability. To preclude such fire-induced loss of coolant accidents (LOCAs), more stringent criteria are applied when performing the circuit analysis for such components. HLP valves are identified by the HLP flag in the SSEL. The implied position of these valves for all safe shutdown modes to maintain the HLP interface integrity is "Closed". If the HLP valves also have an active safe shutdown function, the positions shown in the SSEL designate the desired position to achieve the active safe shutdown function. Per FAQ 06-06, the NEI 00-01 (Rev. 1) definition of a Hi-Lo interface is a valve whose spurious opening could result in a loss of inventory AND an intersystem LOCA. This is in Appendix C of NEI 00-01, which is not mapped to the B-2 Table. Likewise, the NFPA 805 discussion is in Appendix B which was not endorsed by the NRC.

However, as can be seen from a review of both the HNP-E/ELEC-0001 and FAQ 06-06 high low pressure interface definitions, the two are in agreement.

During the re-validation, the definition from the previous SSA was carried forward for conservatism. Thus, some components are classified as high-low interfaces which do not meet the above definition since their spurious opening will not result in a rupture of downstream piping and a subsequent intersystem LOCA. HNP may choose to remove the classification of these components as high-low interfaces at a future date.

The alignment statement in Attachment B will be clarified to include a discussion of the treatment of high-low pressure interface components at HNP.

Add to Alignment Basis Statement of Section 3.1 [Spurious Operations] – Safe Shutdown Systems and Path Development in Attachment B, B-2 table as follows:

> RCS isolation valves (such as the RHR Pump suction valves) are defined as high/low pressure interface boundary valves if their spurious operation could lead to the rupture of low pressure piping and a loss of RCS inventory that exceeds the RCS makeup capability. Such interface boundary valves are subject to more stringent circuit analysis criteria, and are identified in FSSPMD by the HLP flag.
> This high/low pressure interface boundary valve definition is in alignment with that in Appendix C of NEI 00-01 and NFPA-805 FAQ 06-0006.
>
> During the re-validation, the definition from the previous SSA was carried forward for conservatism. Thus, some components are classified as high-low interfaces which do not meet the above definition since their spurious opening will not result in a rupture of downstream piping and a subsequent intersystem LOCA. HNP may choose to remove the classification of these components as high-low interfaces at a future date.

HNP RAI 3-12

On page B-10 of the HNP B-2 Table (entry "3.1.1.3 – Pressurizer Heaters"), the structure of the Alignment Basis statement is focused on crediting pressurizer heaters whenever possible as a means to enhance the operator's ability to ensure that the cooldown rate is controlled. In addition, on page B-21 of the HNP B-2 Table (entry "3.1.2.2 – Pressure Control Systems"), the Alignment Basis statement discusses pressurizer heaters and power operated relief valves (PORVs) as a means to maintain or reduce reactor coolant system (RCS) pressure as necessary during the cooldown process.

However, it is unclear from the HNP nuclear safety capability assessment if there are any fire areas/scenarios where pressurizer heaters are not available to assist during the cooldown process. When pressurizer heaters can potentially be damaged by fire, some licensees include in their post-fire safe shutdown program a requirement that upon loss of pressurizer heaters, the plant will immediately initiate a cooldown in order to maintain a bubble in the pressurizer and

thereby preserve RCS subcooling. Another approach licensees may use to control plant pressure in the event that pressurizer heaters are not available is to take the RCS into solid plant operating conditions.

Please provide a discussion on whether or not HNP has fire areas/scenarios where pressurizer heaters are not available to assist during the cooldown process. If so, how do the plant procedures address this issue (for example, do the procedures require the initiation of a cooldown to maintain the pressurizer steam bubble, or direct the operator to establish solid plant operating conditions in order to preserve pressure control)?

Response: In the deterministic analysis, the only area in which fire damage could potentially result in the loss of all pressurizer heaters was determined to be 1-A-BAL-B2. In this case, the change evaluation (HNP-M/MECH-1117, Attachment 2, Table 2A-) determined that the cables were not with the ZOI of an ignition source.

Attachment B of the Transition Report will be updated to clarify that pressurizer heaters are credited for post-fire safe shutdown.

Revise Section 3.1.1.3 – Pressurizer Heaters Alignment Basis Statement in Attachment B, B-2 Table as follows:

> Though not specifically required based on the guidance of NRC Generic Letter 86-10, the use of pressurizer heaters is not discouraged nor does their use conflict with the guidance of NEI 00-01. The Harris SSA does credit pressurizer heaters. The availability of the heaters enhances the operator's ability to ensure that cooldown rate is controlled, and that the cooldown process adheres to the required pressure and temperature limits.

HNP RAI 3-13

On page B-20 of the HNP B-2 Table (entry "3.1.2.1 – Reactivity Control"), the Alignment Basis statement implies that the use of borated water is a requirement to ensure an adequate shutdown margin is maintained during plant cooldown. In addition, most 10 CFR Part 50, Appendix R post-fire SSD analyses for pressurized water reactors (PWRs) include a requirement to control the plant at Hot Standby until sufficient boron is added to the RCS to ensure that the reactor remains subcritical throughout the cooldown process.

Given these factors, is switchover to the refueling water storage tank and the boric acid tank (RWST and BAT) a time critical action, or is switchover only required prior to initiating a plant cooldown? In addition, please provide a discussion of how HNP meets the reactivity control nuclear safety performance criteria prior to switchover to the RWST and BAT.

Response: The RWST and BAT are identified as the credited sources of makeup water since normal makeup is not credited for Safe Shutdown. Either tank has sufficient boron to ensure stable hot standby conditions can be achieved.

Calculation HNP-F/NFSA-0171, HNP RCS Cooldown without Boration, determined that the RWST boron concentration is adequate to maintain Shutdown Reactivity during a cooldown to Cold Shutdown conditions (200°F) without letdown (other than normal RCP Seal leakage out of the RCP seals). Alignment to the RWST is an early step in the AOP for scenarios where the Control Room is not evacuated, since normal makeup from the VCT is not credited. For Alternate Shutdown, the CSIP is stopped until the RWST valves can be aligned to support the CSIP. This will automatically start the ASI pump which has a suction source equivalent to the RWST in Boron Concentration. In addition, if charging is lost for any reason (including the loss of the RWST) and any area where RCP Seal Injection can be lost due to a fire, the ASI pump/diesel will be available to provide RCS makeup/seal injection.

Attachment B of the Transition Report will be revised to include this clarification.

Revise Section 3.1.2.1 Alignment Basis Statement of Attachment B, B-2 Table as follows:

> If an automatic reactor trip has not already occurred, the analysis credits a manual trip to establish the initial shutdown condition. The two credited sources of makeup water for post-fire safe shutdown are the boric acid tank and the RWST. The boric acid concentration in either tank will ensure that an adequate shutdown margin will be maintained throughout the cooldown process. AOP-004 and AOP-036 (series) direct the operator to determine the amount of boron that must be added to ensure an adequate shutdown margin is maintained.
>
> HNP-F/NFSA-0171, HNP RCS Cooldown without Boration, determined that the boron concentration of the RWST is sufficient (and without letdown) to maintain an adequate shutdown margin in the event the plant is cooled to cold shutdown conditions. The AOPs allow the operator the option of aligning the BAT to the suction of the charging pump in parallel with the RWST if desired.
>
> HNP-F/NFSA-0171, HNP RCS Cooldown without Boration, has been added as a reference in the B-2 Table.

HNP RAI 3-14

On page B-41 of the HNP B-2 Table (entry "3.2.1.6 – Spurious Components"), the Alignment Basis discussion states that Section 9.1.2.7 of FPIP-0104 directs that for boundaries formed by three normally closed valves or dampers in series, all three should be included in the Safe Shutdown Equipment List (SSEL). Please provide a justification for establishing a limit of three spurious actuations in this situation for inclusion in the nuclear safety performance assessment.

On page B-74 of the HNP B-2 Table (entry "3.5.1.5 – Circuit Failure Risk Assessment Guidance"), the discussion throughout the element uses Regulatory Issue Summary (RIS) 2004-03, "Risk-Informed Approach for Post-Fire Safe-Shutdown Circuit Inspections," as the

basis for the SSD analysis regarding multiple spurious operations. RIS 2004-03 was developed to provide risk-informed guidance to NRC inspectors; it was not intended to be used as a justification for design and/or licensing basis decisions, or as a means to assess the risk-significance of circuit failures. Please provide a justification for limiting the consideration of multiple spurious operations in the design and licensing basis to that described in RIS 2004-03.

Response: The identification of three valves in series described in FPIP-0104 (FIR-NGGC-0101) was the deterministic basis. During the NFPA-805 transition, HNP performed a series of MSO Expert Panel systems reviews that did not limit the scope to any specific number. Results were fed back into the NSCA and FPRA as necessary. Attachment F provides the MSO methodology.

Attachment B of the Transition Report will be revised to include this clarification.

Revise the Alignment Statement for 3.2.1.6 of Attachment B, B-2 Table as follows:

> Section 9.1.2.7 of FPIP-0104 directs that for boundaries formed by three normally closed valves or dampers in series, all three should be included in the SSEL. RIS 2004-03 is not specifically identified as the basis for identifying three series boundary valves/dampers, and was not used as a basis document in identifying required components or cables.
>
> The identification of three valves in series described in FPIP-0104 (FIR-NGGC-0101) was the deterministic basis. During the NFPA-805 transition, HNP performed a series of MSO Expert Panel systems reviews that did not limit the scope to any specific number. Results were fed back into the NSCA and FPRA as necessary. Attachment F provides the MSO methodology.

Revise the Alignment Statement for 3.5.1.5 of Attachment B, B-2 Table as follows:

> Shearon Harris performed a multiple spurious operations review in accordance with the guidelines of NRC RIS 2004-03. The results of this and other MSO reviews are contained in Appendix 14 of the safe shutdown analysis.
> RIS 2004-03 was issued to provide guidance to NRC inspectors in determining the potential risk-significance of fire-induced circuit faults. As noted in the RIS, this guidance was not to be used to eliminate or justify potential non-compliances with the plant's current licensing basis. The guidance in RIS 2004-03 was not used in developing the procedures for component or cable selection during the re-analysis.
>
> Although the RIS places a limit of damage to two cables that could cause concurrent spurious actuations, the plants MSO review contained no such limits.

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HNP RAI 3-15

On page B-42 of the HNP B-2 Table (entry "3.2.1.7 – Instrument Tubing"), the NEI 00-01 Guidance section of the element discusses evaluating the effects of fire damage to circuits and equipment in the fire area while taking into consideration the location of instrument tubing that may cause subsequent effects on instrument readings or signals as a result of fire.

With regard to instrumentation tubing:

- *In their analyses of potential fire impacts on instrumentation tubing, some licensees have discovered that exposure fires could result in sufficiently elevated temperatures that instrument tubing yield strength values may be exceeded and tubing rupture might become possible. Please describe how instrument tubing integrity is assured at HNP.*

- *RG 1.205 endorses the deterministic post-fire safe shutdown analysis methodology provided in Chapter 3, "Deterministic Methodology," of NEI 00-01. Section 3.2.1.2 of NEI 00-01 indicates that heat sensitive piping materials, including tubing with brazed or soldered joints, should be evaluated for the effects of exposure fire damage.*

Please provide documentation that demonstrates that heat sensitive piping materials, including tubing with brazed or soldered joints, have been evaluated for the effects of exposure fire damage. Include information that demonstrates that the nuclear safety performance criteria are maintained when fire affects the instrument-sensing lines, especially any that are constructed of materials having a relatively low melting point (such as copper) and those that include brazed or copper fittings.

Response: The instrument tubing evaluation is in Appendix 11 of HNP-E/ELEC-0001. The analysis states that the pressure boundary will not be breached as a result of fire damage to the sensing lines.

Instrument tubing for credited instruments was included in NSCA, and evaluated similar to a cable, such that the instrument was assumed to fail in areas containing its associated tubing. These tubes are welded steel; based on this, the pressure boundary will not be breached as a result of fire damage to the sensing lines. EGR-NGGC-0151, Evaluating Instrument Sensing Line Installations, Rev. 4, provides the applicable installation guidance.

Attachment B of the Transition Report will be revised to include this clarification.

Revise Alignment Basis Statement for 3.2.1.7 of Attachment B, B-2 Table as follows:

> The instrument tubing evaluation is in Appendix 11 of HNP-E/ELEC-0001. These sensing lines are welded steel, and the analysis concludes that the pressure boundary will not be breached as a result of fire damage to the sensing lines.

Instrument tubing for credited instruments was included in the NSCA, and evaluated similar to a cable. Instrument sensing lines exposed to fire are assumed by the SSA to result in erratic indications.

Add Appendix 11 to the applicable sections of HNP-E/ELEC-0001.

Add the following to the Alignment Statement for Section 3.2.1.2 of Attachment B, B-2 Table:

The instrument tubing evaluation is in Appendix 11 of HNP-E/ELEC-0001. These sensing lines are welded steel, and the analysis concludes that the pressure boundary will not be breached as a result of fire damage to the sensing lines.

HNP RAI 3-16

On page B-69 of the HNP B-2 Table (entry "3.5.1.1 – Circuit Failure Types and Impact"), the Alignment Basis statement discusses a previously evaluated deviation from the traditional SSD analysis assumption that cable-to-cable interactions must be assumed to occur.

However, based on industry and NRC sponsored fire testing of cables, this deviation can no longer be supported (operating experience and fire testing have made the deviation invalid). Please provide a justification for maintaining this SSD analysis deviation in the HNP B-2 Table.

Response: The deviation referenced in the RAI is part of the plant's current licensing basis, and has been used in the deterministic analysis. Since the B-2 Table is meant to be a comparison of NEI 00-01 guidance to the plant's existing safe shutdown methodology, it is appropriate to discuss it here. It is correctly noted that prior NRC approval for the deviation in the methodology does exist.

The B-2 Table alignment statement concludes as follows:

"Post transition analyses and modifications will consider inter-cable hot shorts to be a credible circuit failure mode, and the SSER 3 position will not be relied upon as the sole means of compliance."
Note that the CLB position is used in the deterministic analysis based on the SER. Going forward, all applicable designs will consider cable-to-cable hot shorts as possible interactions, and the SSER position will not be relied upon. Also note that the fire PRA took no credit for this position.

HNP RAI 3-17

On page B-77 of the HNP B-2 Table (entry "3.5.2.1 – Circuit Failures Due to an Open Circuit"), the NEI 00-01 Guidance section of the element discusses the potential for secondary damage created by an open circuit associated with a high voltage current transformer (CT) circuit.

An open circuit associated with a loaded CT can result in catastrophic failure of the CT, possibly resulting in a fire at another location (e.g., fire damage on a cable that runs from a switchgear room to the control room could result in failure of the CT, located at the switchgear, causing an additional fire at the switchgear).

The Alignment Basis statement for this element does not address how high voltage circuits with CTs were treated in the nuclear safety capability assessment. Please provide additional information regarding how high voltage CTs were addressed in the HNP SSD analysis.

Response: CTs provide input to remote ammeters/watt meters/var meters for 22 kV and 6.9 kV applications, as well as ammeters for 480 V loads. This input does not feed directly into the ammeter. Instead, each has an isolation device (typically a transducer) that eliminates the issue except between the device and the CT. The area of exposure remains inside breakers or in the component area, such as the diesel generator rooms, FPYARD for Startup, Unit Auxiliary, and Main Transformers, and in the Switchyard, but do not exit the fire area. Thus, a CT fault of the type described cannot cause a secondary fire outside the area of concern.

For ammeters, these devices are typically 5 amps in and 4 – 20 milliamp or 1.0 milliamp out. For Watt/Var output, the isolation device may be a DC isolator (eg EDGs).

In the circuit analysis performed for safe shutdown components, the cables providing the ammeter indication are identified in FSSPMD. They have a failure mode effects analysis of "NA" indicating they are not part of the main circuit (since they are isolated by a suitable isolation device) and will not impact the component's ability to perform its safe shutdown function.

Add to Alignment Basis for Section 3.5.2.1 – Circuit Failures Due to an Open Circuit of Attachment B, B-2 Table as follows:

> The Harris SSA does consider open circuits. This section provides information related to the effects of an open circuit on different types of typical circuits.
> For the unique case of CT circuits, the design of the Harris CTs precludes the possibility of secondary damage. Specifically, each remote Ammeter / Watt Meter / Var meter for 6.9 KV applications, as well as ammeters for 6.9kV and 480 V loads, do not connect directly to the CT. Instead, each has an isolation device, such as a transducer, that serves as a suitable isolation device between cable faults on the cable for the remote indication and the CT itself.

HNP RAI 3-18

On page B-86 of the HNP B-2 Table (entry "3.5.2.4 – Circuit Failures Due to Inadequate Circuit Coordination"), the NEI 00-01 Guidance section of the element discusses circuit failures due to

inadequate circuit coordination between the supply breaker/fuse and the load breakers/fuses for power sources that are required for safe shutdown.

An additional concern with respect to fire propagation among associated circuits of a common power source is fire-induced damage to direct current (DC) control power, resulting in the inability to trip fire damaged circuits (see Daily Event Report No. 44351, dated July 16, 2008, from the Point Beach Nuclear Station).

To address this, the common enclosure analysis should include a review of potential fire damage to DC control power circuits associated with electrical switchgear, which may result in a fire-induced loss of tripping capability to one or more circuit breakers within the switchgear. This is relevant as a loss of tripping capability combined with a fire-induced short to ground on the load cable could result in fire propagation through the common enclosure.

Please describe how the HNP common enclosure analysis addressed the issue of fire-induced damage to DC control power.

Response: There are no associated circuits by common enclosure that created a compliance issue. If any did exist, they would have been identified in the individual fire area assessment (NSCA) and any open items identified in the B-3 Table.

The required cables for all switchgear credited for safe shutdown include the DC control power cables. Within the safe shutdown fault tree, the support equipment required to ensure DC control power is available to the switchgear is captured. Loss of DC control power results in loss of that switchgear, and the analyst would recognize that protective relaying would not be available.

HNP RAI 3-19

On page B-86 of the HNP B-2 Table (entry "3.5.2.4 – Circuit Failures Due to Inadequate Circuit Coordination"), the Alignment Basis discussion states that "associated circuits by common power supply were identified and dispositioned during the cable selection and circuit analysis process. Where a lack of coordination created a compliance issue, the cables were dispositioned in a manner similar to other cables in the area under analysis that could adversely affect safe shutdown." Please provide a list of associated circuits where a lack of coordination created a compliance issue and provide the associated disposition for each.

Response: There are no associated circuits by common power supply that created a compliance issue. If any did exist, they would have been identified in the individual fire area assessment (NSCA) and any open items identified in the B-3 Table.

The Alignment Statement for Section 3.5.2.4 – Circuit Failures Due to Inadequate Circuit Coordination, of Attachment B, B-2 Table, will be revised as follows:

Associated circuits by common power supply were identified and dispositioned during the cable selection and circuit analysis process. During the fire area by fire area review, no compliance issues due to a lack of circuit coordination were identified. The required cables for all switchgear credited for safe shutdown include the DC control power cables. Within the safe shutdown fault tree, the support equipment required to ensure DC control power is available to the switchgear is captured. Loss of DC control power results in loss of that switchgear, and the analyst would recognize that protective relaying would not be available.

HNP RAI 3-46

In Attachment D, "NEI 04-02 Table F-1 Non-Power Operational Modes Transition," of the Harris Transition Report, page D-3 states that approximately 16 additional power operated components were identified as being needed to support a NPO Key Safety Function (KSF) that were either not included on the post-fire safe shutdown equipment list, or the component had a different functional requirement for NPO than it did for safe shutdown, and required additional circuit analysis. Please provide a list of the additional components needed to support a NPO KSF, and for those that have a different functional requirement, describe the difference between the safe shutdown function and the NPO function.

Response: The table below includes a listing of the 16 power operated components that were included in the HNP NPO modes review but are not required to support the post-fire safe shutdown analysis. However, a review of the NPO modes evaluation data indicates that there are no components (manual or power operated) that have a different functional requirement for NPO than they did for the safe shutdown analysis.

The 4th paragraph under the Review discussion for Implementing Guidance F-2 will be revised to clarify this item.

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Equip Tag No.	System	Equipment Description	Type
1CS-470	CVCS	RCP SEAL WATER RETURN INSIDE ISOLATION VALVE	MOA
1CS-472	CVCS	RCP SEAL WATER RETURN OUTSIDE ISOLATION VALVE	MOA
1CS-570	CVCS	MOD HT XCHGR TUBE SIDE INLET ISOLATION VALVE	AOA
1CS-745	CVCS	CHARGING PUMP A TO REFUEL WATER STORAGE TANK	MOA
1CS-753	CVCS	CSIP B ALT MINIFLOW RELIEF TO RWST	MOA
1CS-98	CVCS	CVCS MODERATING HEAT EXCHANGER BYPASS VALVE	AOA
1D32	PDSAC	MCC, TURBINE BUILDING EL 286'	MCC
1E32	PDSAC	MCC, TURBINE BUILDING EL 286'	MCC
1RC-46	RCS	HEAD FLANGE SEAL LEAKOFF LINE ISOLATION VALVE	AOA
FI-01CS-0150.1W	INST	LETDOWN HEAT EXCHANGER OUTLET	FI-
LI-01RC-0403	INST	RCS STANDPIPE LEVEL INDICATOR	LI-
LI-01RC-0462W	INST	PRZR LEVEL AT LOW TEMP	LI-
TR-01RH-0604W	INST	RHR HEAT EX 1A-SA OUTLET TEMPERATURE	TR-
TR-01RH-0606W	INST	RHR HEAT EX 1B-SB OUTLET TEMPERATURE	TR-
UAT-A	PDSAC	UNIT AUXILIARY TRANSFORMER 1A	XFP
UAT-B	PDSAC	UNIT AUXILIARY TRANSFORMER 1B	XFP

Equipment Type Codes:

AOA	air operated valve
FI-	flow indicator
LI-	level indicator
MCC	motor control center
MOA	motor operated valve
TR-	temperature recorder
XFM	Transformer

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HNP RAI 3-47

In Attachment D of the Harris Transition Report, on page D-4, the cited implementation reference (NEI 04-02) includes a requirement that the review identify locations where KSFs are achieved solely by crediting recovery actions (e.g., alignment of gravity feed). However, the description of the NPO review for HNP does not mention locations where KSFs are achieved solely by crediting recovery actions.

Please clarify whether or not the NPO review for HNP included consideration of recovery actions, and if there were any KSFs that are achieved solely by crediting recovery actions.

Response: There is only one KSF that is achieved solely by crediting recovery actions. However, there were five (5) instances noted during the NPO modes review (analysis) where recovery actions were identified as possibly being needed if a KSF path was not fully operational.

1. RHR flow control – The RHR heat exchanger outlet and bypass valves for the credited RHR train were identified as possibly failing in some fire areas. If this failure were to occur, recovery actions would be required to recover the decay heat removal KSF. The failure modes of these valves are such that flow will remain through the RHR heat exchanger and to the RCS. The analysis identified that there is an existing abnormal operating procedure that will address this potential concern, and proposed revisions to this procedure will provide additional recommended actions.

2. RHR loop temperature – If RHR loop temperature indication for the credited RHR train in the MCR is lost as a result of a fire, an existing procedure includes actions that would be utilized to monitor RHR temperature using existing local temperature indicators.

3. Volume Control Tank (VCT) outlet – The VCT outlet valves are subject to failure such that they might not be capable of being closed remotely when it comes time to shift charging pump suction from the VCT to the RWST. Procedures currently exist that will verify that charging pumps are isolated from the VCT before shifting to the RWST, and that they contain those actions necessary to locally align the valves.

4. 120VAC UPS – In the event any of the existing 120VAC uninterruptible power supplies fails, an existing procedure provides actions to respond to the loss of this power supply. This procedure includes the use of backup power supplies, alternate components or paths, and/or local actions to compensate for a loss of component control.

5. Charging Pumps – The NPO analysis identified certain component failures that could result in a loss of the charging pumps as a means to makeup to the RCS for either inventory or reactivity control. In the event this were to occur the analysis identified the following: 1) at least one RHR pump would be available to makeup to the RCS

from the RWST, or 2) gravity feed to the RCS from the RWST could be used if the RCS is depressurized, or 3) sufficient time would be available to setup temporary ventilation if normal HVAC were lost to the charging pumps room.

Procedure revisions resulting from NPO recovery actions will be documented under EC 67999, HNP NFPA 805 Transition.

HNP RAI 3-48

In Attachment D of the Harris Transition Report, page D-6 states that "approximately 20 generic pinch points were identified during the performance of the NPO fire area reviews." Please describe how these generic pinch point locations will be identified to the plant for disposition during the NFPA 805 implementation process.

Response: The pinch points identified during the NPO modes analysis are documented in HNP calculation HNP-E/ELEC-0002, "NFPA 805 Transition – Non-Power Operational Modes Review," along with recommendations to mitigate the potential loss of a KSF. The specific KSF paths that may not be available and the Fire Area of concern are identified in the calculation as well. The calculation provides a matrix of KSFs vs. fire areas along with codes to identify fire areas with potential pinch points.

While the calculation has identified that some pinch points will be eliminated through the implementation of plant modifications, there are others that will rely on existing procedures (or revisions to them) to prevent the pinch point from occurring through either plant equipment alignment during the shutdown process, or by providing recovery actions. In addition to the above calculation, plant procedures listed below may be revised to reduce the possibility of a pinch point occurring or to provide methods for recovering from the loss of a KSF path should it occur. The final determination to modify these (or other) procedures will be made during preparation and approval of Engineering Change EC 67999, HNP NFPA 805 Transition.

- OMP-003, Outage Shutdown Risk Management
- AOP-020, Loss of RCS Inventory or Residual Heat Removal While Shutdown
- AOP-020-BD, basis document for AOP-020
- AOP-024, Loss of Uninterruptible Power Supply
- AOP-036, Safe Shutdown Following a Fire
- AOP-036BD, basis document for AOP-036
- EPT-373, 1CS-745 SI Alternate Miniflow Isolation Valve Generic Letter 89-10 MOV Test
- FPP-005, Duties of a Fire Watch
- FPP-013, Fire Protection – Minimum Requirements, Mitigating Actions and Surveillance Requirements
- GP-002, Normal Plant Heatup from Cold Solid to Hot Subcritical Mode 5 to Mode 3
- GP-007, Normal Plant Cooldown Mode 3 to Mode 5
- GP-008, Draining the Reactor Coolant System
- GP-009, Refueling Cavity Fill, Refueling and Drain of the Refueling Cavity Modes 5-6-5

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HNP RAI 3-49

In Attachment D of the Harris Transition Report, on page D-7, the passage regarding plant operating state (POS) 1A should be updated to reflect Revision 4 to NFPA 805 FAQ 07-0040, "Non-Power Operations Clarifications." In FAQ 07-0040, Revision 4, POS 1A is not screened; instead, normal fire protection defense-in-depth actions are taken. Please verify that the analysis performed for NPO at HNP is consistent with NFPA 805 FAQ 07-0040, Revision 4.

Response: The text included on Page D-7 (Attachment F-1A) of the LAR was copied from HNP calculation HNP-E/ELEC-0002, which was prepared and approved prior to Revision 2 of FAQ 07-0040 being submitted to the NRC (May 21, 2008), deleting the "Screened" term.

However, the HNP NFPA 805 Project Team monitored the changes being made to FAQ 07-0040 and verified that changes made did not invalidate any of the work performed for HNP, or require additional analysis, to be in-line with the proposed changes to NEI 04-02. The NPO modes review performed for HNP followed the process provided in current version (Rev. 4) of FAQ 07-0040.

The text in Attachment F-1A of the LAR will be revised to delete the "screened" terminology, and identify that no additional reviews for the POS where steam generators are still available will be required under NEI 04-02, based upon the risk reviews cited in FAQ 07-0040, Rev. 4.

HNP RAI 3-64

Additional information is required by the NRC staff in order to support a conclusion that electrical protective device coordination has been assured in accordance with the requirements of NFPA 805, Section 2.4.2.2.2, "Nuclear Safety Capability Assessment – Other Required Circuits." This section states that circuits which share a common power supply with circuits required to achieve the nuclear safety performance criteria shall be evaluated for their impact on the ability to achieve the nuclear safety performance criteria.

The applicable reference cited in the HNP B-2 Table (HNP-E/ELEC-0001, "Safe Shutdown in Case of Fire and Fire Hazards Analysis," Revision 2) under numerous safe shutdown elements was developed to address the effects of fire during full power operations. As a result, this calculation may not adequately bound all of the nuclear safety concerns established in NFPA 805, such as non-power operations. During the onsite regulatory audit at HNP, plant representatives acknowledged certain deficiencies in the existing study (i.e., backfeed).

Please provide a supplemental discussion/justification on the use of HNP-E/ELEC-0001 to meet the requirements of NFPA 805, Section 2.4.2.2.2, and/or address other means that are being used at HNP to appropriately meet the requirements of the rule.

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Response: The B-2 table refers to the appropriate coordination studies. With the exception of back feed (Disconnect the Main Generator disconnect link and bring power from the switchyard through the Main Transformers, to the Unit Auxiliary Transformers, to Aux Bus 1D-NNS and 1E-NNS; 1D-NNS and 1E-NNS are coordinated) all other NPO concerns are bounded by the SSA. The coordination study will be updated prior to implementation.

HNP RAI 3-65

Additional information is required by the NRC staff in order to support a conclusion that HNP meets all aspects of the NFPA 805, Section 2.4.2.2.2, requirements with regard to common enclosure circuit/cable issues. This section states that circuits which share common enclosures with circuits required to achieve the nuclear safety performance criteria shall be evaluated for their impact on the ability to achieve the nuclear safety performance criteria.

The applicable references cited in the HNP B-2 Table under numerous safe shutdown elements do not provide a clear technical description of how the common enclosure issue was addressed during all modes of operation at HNP, as well as for all non-essential cables of concern.

Please provide a supplemental discussion/justification on the use of the current documentation to meet the requirements of NFPA 805, Section 2.4.2.2.2, and/or address other means that are being used at HNP to appropriately meet the requirements of the rule.

Response: The plant was originally designed with general coordination to insure that a fault on a cable would not damage the cable. EGR-NGGC-0103, 0104, 0105, 0106 and 0108 provide the guidance to insure that cable faults are isolated prior to reaching temperatures that could result in cable damage.

Per EGR-NGGC-0103, and 0105, "The temperature T2 is the temperature the conductor will rise to in t seconds for a fault of I amperes. The short circuit temperature rating of the cable is used as a value for T2. 250°C is a typical short circuit temperature rating for 90°C continuous rated cable. However, other values (both higher and lower) exist. Vendor information for the specific cable should be obtained for this value."

Additionally, PLP-628, Plant Fuse Control Program For 1E and Non-1E Applications, provides guidance for replacement of fuses including completing a Fuse Replacement Log (Attachment 2) for each fuse.

OPS-NGGC-1301 requires that, "For clearances that involve the removal of fuses, fuse control and accountability shall be according to site procedures." On every clearance, removal of the fuse requires validation to ensure installation of the proper fuse. If the proper fuse is not installed, the proper fuse is installed and a PLP-628 Attachment 2 is completed.

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HNP RAI 3-66

NFPA 805 requires licensees to provide reasonable assurance that a fire during any operational mode and plant configuration will not prevent the plant from establishing and maintaining the fuel in a safe and stable condition. During NPO modes, spurious actuation of valves can have a significant impact on the ability to maintain decay heat removal and inventory control. Please provide a description of any actions being taken to minimize the impact of fire-induced spurious actuations on power operated valves (air operated valves (AOVs) and/or motor operated valves (MOVs)) during NPO (i.e., pre-fire rack-out, pinning valves, isolating air supplies, etc.).

Response: The NPO modes review for the HNP identified four (4) instances where pinch points could develop as a result of spurious operation of a plant component and provided a proposed course of action to be taken to prevent them from occurring. The following is a summary of the components, and proposed course of action:

1. RHR pump suction valves – The review found that there could be instances where one of the two suction valves for the credited RHR train could spuriously close while the RHR pump were operating. If this were to occur, the operating pump could be seriously damaged and rendered inoperable. The analysis determined that this spurious valve closure only occurs to the suction valve that is powered from the opposite electrical train as that of the credited RHR pump. In order to prevent this from occurring during shutdown cooling when the risk for fuel damage is greater, plant procedure revisions have been recommended while in Modes 5 or 6 to de-energize the RHR suction valve that is powered from the opposite electrical train as the pump to be operated whenever the Reactor Coolant System water level is at a reduced inventory condition which is defined as ≤ 36 inches below the reactor vessel flange.

2. RHR cross-connect with CVCS – Spurious opening of either 1RH-25 or 1RH-63 when the associated RHR train is operating could result in a diversion of RHR flow and a RCS inventory control concern. These valves only need to be open for accident mitigation in the event the contents of the Containment sump needs to be pumped into the RCS using the high pressure CSIPs. Since the Technical Specification requirement to have automatic alignment of safety injection will not be applicable when the plant is on RHR shutdown cooling, it has been recommended to verify that these valves are closed and de-energize them at their respective MCC when the plant has entered Mode 5 (i.e. reactor temperature is less than 200°F and the steam generators are no longer available to remove decay heat).

3. 1SI-359 – Spurious opening the of the RCS hot leg valve 1SI-359 during shutdown cooling could result in a short cycling of the RHR flow path resulting in inadequate cooling of the reactor core. During shutdown cooling, either 1SI-326 or 1SI-327 (associated with RHR loop being used) is closed, but power is not removed. It has been identified that there are potential fire scenarios where

either 1SI-326 or 1SI-327, and 1SI-359 could open and create a thermal short cycling situation for RHR. To prevent this situation, it has been recommended that power be removed from 1SI-359 at the same time 1RH-25 and 1RH-63 are de-energized as it is no longer required to be operable when the plant has entered Mode 5 (i.e. reactor temperature is less than 200°F and the steam generators are no longer available to remove decay heat).. For those situations during Modes 5 and 6 where 1SI-359 may need to be opened for a short period of time, the restoration of power to the valve and its operation will be under procedural control with the valve closed and de-energized again as soon as the activity requiring it to be open is completed.

4. CVCS Alternate Minimum flow valves – The alternate minimum flow path for the charging pumps back to the RWST is required during actuation of safety injection. During normal system alignment, the path is isolated by having valves 1CS-746 and 1CS-752 closed. The NPO review identified that a postulated fire in certain areas could result in these valves opening resulting in a diversion of RCS inventory to the RWST. Since these valves only need to be operable when safety injection needs to be available, it has been recommended that power to these valves be removed when the plant enters Mode 5.

5. Please provide the following information concerning risk assessments and plant change evaluations:

HNP RAI 5-1

During the onsite regulatory audit at HNP, the NRC staff identified apparent anomalies in the CDF and LERF calculations for Fire Compartment 03 (FC03). The results of CDF and LERF calculations performed for each potential fire source in FC03 were compared with the information contained in Attachment Y, "NFPA 805 Transition Risk Insights," of the Harris Transition Report, and HNP-F/PSA-0081, "Harris Fire PRA – Support for NFPA 805 Transition."

For a number of components in FC03 (e.g., FC03-S1521 – Annunciator Cabinet 2), the reported values for LERF were a factor of two higher than the reported values for CDF, which is not a correct result (i.e., the calculated LERF value must always be less than or equal to the CDF value). Although the associated risks for the affected FC03 components are small, the anomaly does not appear to be a result of the screening method used for low probability events.

A review of Attachment 19 to calculation HNP-F/PSA-0079, "Harris Fire PRA – Quantification Calculation," Revision 1, reveals that except for FC03, the ratio of LERF to CDF for all other fire compartments is less than 15 percent. However, for FC03, this ratio is nearly 60 percent.

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Further, a review of the data spreadsheets associated with HNP-F/PSA-0079 indicate that 12 fire scenarios in FC03 have LERFs that are greater than CDFs, and another 23 fire scenarios have LERFs between 60 and 100 percent of their CDFs. In fact, of the 59 scenarios where the ratio of fire LERF to CDF exceeds 20 percent, all but five are associated with FC03.

Please provide an explanation for these apparent anomalies in the CDF and LERF calculations for FC03, and clarify what should be the fire LERF for FC03. In addition, discuss how this affects the total fire LERF and any associated delta-LERF calculations for FC03 and other potentially impacted fire compartments.

During the onsite regulatory audit at HNP, plant representatives suggested that the very high LERF ratio for FC03 may be the result of truncation errors in the associated calculations. If this is so, please explain why this truncation error appears only for FC03 (i.e., no other compartment showed such a high LERF ratio, although there are absolute LERF values that are comparable in other compartments). Alternatively, if the LERF value for FC03 is correct and the truncation error occurred in the CDF calculation, then the reported CDF for FC03 (9.62E-7/year) could be up to five times higher. Therefore, please discuss how HNP has assured that the truncation effect is isolated only to FC03 and does not affect the CDF or delta-CDF values significantly.

Response: Since most of the LERF sequences are truncated at an order of magnitude below the corresponding CDF sequences, part of the anomaly is due to truncation. The lower truncation is intended to allow retention of the level 1 cutsets with the containment failure events applied. When there are minimal containment failure events, additional level 1 cutsets can be added.

The predominant LERF issue is due to a limitation of the "minimal cutset upper bound" (MCUB) quantification method used in the CAFTA cutset editor when applying high probability values. Most of the noted discrepancies deal with containment isolations involving two penetrations with potential spurious opening of the isolation valves. The spurious events are from intra-cable hot shorts with a probability of 0.6. There are two possible valve combinations that can fail each penetration with a probability of 0.36 (= 0.6 * 0.6), producing four possible release combinations for each CDF sequence. This results in a simplified probability of release (or LERF) of 1.44 (=4 * 0.36).

Therefore, depending on the specific cables being impacted by a fire, it is possible for the LERF results to be 1.44 times CDF. A more exact Boolean solution of the logic tree would not result in a value greater than 1.0. Since FC03 is the room containing the cabinets that control the containment isolation functions, the discrepancies are most evident in that room. To validate the impact, the LERF cutsets for source FC03_S1521 were processed using a beta release of a new EPRI product called ACUBE, which is able to perform a more rigorous Boolean solution. This use of ACUBE reduced the LERF by about 48 percent.

The anomalies always result in a conservative estimate for LERF. In addition, they do not impact the delta risk calculations, which remain below the acceptance threshold, and should not impact the decision regarding the application.

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HNP RAI 5-2

NFPA 805, Section 2.4.1.2.1, "Fire Modeling Calculations – Acceptable Models," states:

> *Only fire models that are acceptable to the authority having jurisdiction shall be used in fire modeling calculations.*

Section 4.5.2, "Fire Modeling," of the Harris Transition Report states:

> *The approach taken at HNP to simplify the analysis process incorporates features of several fire model tools covered by NUREG-1824[, "Verification and Validation of Selected Fire Models for Nuclear Power Plant Applications,"] as well as additional features.*

Please identify the specific fire models, tools, and correlations (such as the Beyler/Shokri detailed target heat flux correlation) used at HNP, including the "additional features" referred to in Section 4.5.2 of the Harris Transition Report. In addition, provide specific version information (e.g., for the Consolidated Fire Growth and Smoke Transport (CFAST) model and/or the Fire Dynamics Simulator (FDS)) for any fire modeling software products used.

Response: "Fire Modeling Generic Treatments", developed as a proprietary Hughes Associates, Inc. report, was used in part by HNP for the fire scenario development. The Table provided in the response to RAI 5-2(a) (below) provides a summary of the correlations that have been used to develop the zone of influences about ignition sources in the 'Generic Treatments' document. Specific fire modeling tools that were used include the following:

Fire Dynamics Tools (FDTs) – NUREG-1805
Fire Dynamics Simulator (FDS) – Version 4.0.7
Consolidated Fire Growth and Smoke Transport Model (CFAST) – Version 6.0.10.61027

HNP-M/MECH-1196 evaluated propagation or cable damage of targets above select electrical cabinets by calculating the temperature of the exposing vent plume at the target cable tray positions using methods presented Yokoi, S., "Study on the Prevention of Fire Spread Caused by Hot Upward Current," Report Number 34, Building Research Institute, Tokyo, Japan, 1960. The vent mass flows, external burning, and gas temperatures were determined using the zone model CFAST and subsequently used as inputs to the plume trajectory correlation.

Additional data from NUREG-6850 for solid bottom trays and cable soak time were incorporated where appropriate.

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Table RAI 5–2(a) – Summary of Correlations used in the Generic Treatments Document.

Correlation	Location in Treatments	Original Reference	Application	Original Correlation Range	Subsequent Validation and Verification	Limits in Treatments
Flame Height	Page 18	Heskestad [1981]	Provides a limit on the use of the Zone of Influence (ZOI)	$-4 < \log_{10}\left(\frac{c_p^3 T_o \Delta T_f}{g^2 \rho_o^2}\right)\frac{\dot{m}r^3}{\alpha \Delta H_c D^5} < 1$ In practice, wood and hydrocarbon fuels, momentum or buoyancy dominated, with diameters between 0.05 – 10 m.	Directly NUREG 1824 [2007] Volume 3 Indirectly NUREG 1824 [2007] Volume 5 (Correlation used in CFAST)	$\frac{4\dot{m}\Delta H_c}{\pi D^2} < 3000$
Point Source Model	Page 19	Modak [1976]	Lateral extent of ZOI – comparison to other methods	Isotropic flame radiation. Compared with data for 0.37 m diameter PMMA pool fire and a target located at a Ro/R of 10.	NUREG 1824 [2007] Volume 3; SFPE [1999]	Predicted heat flux at target is less than 5 kW/m² per SFPE [1999]
Method of Shokri and Beyler	Page 19	Shokri et al. [1989]	Lateral extent of ZOI – comparison to other methods	Pool aspect ratio < 2.5 Hydrocarbon fuel 1 – 30 m diameter Vertical target, ground level	SFPE [1999]	Ground based vertical target
Method of Mudan (and Croce)	Page 20	Mudan [1984]	Lateral extent of ZOI – comparison to other methods	Round pools; Hydrocarbon fuel 0.5 – 80 m diameter.	SFPE [1999]	Total energy emitted by thermal radiation less than total heat released
Method of Shokri and Beyler	Page 20	Shokri et al. [1989]	Lateral extent of ZOI	Round pools; Hydrocarbon fuel 1 – 50 m diameter	SFPE [1999] NUREG 1824 [2007] Volume 3	Predicted heat flux at target is greater than 5 kW/m² per SFPE [1999] Shown to produce most conservative heat flux over range of scenarios considered among all methods considered.
Plume heat fluxes	Page 22	Wakamutsu et al. [1996]	Vertical extent of ZOI	Fires with an aspect ratio of about 1 and having a plan area less than 1 m².	Wakamatsu et al. [2003] (larger fires) Lattimer [2008]	Area source fires with aspect ratio ~ 1. Used with plume centerline temperature correlation; most severe of the two is used as basis for the ZOI dimension.

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Correlation	Location in Treatments	Original Reference	Application	Original Correlation Range	Subsequent Validation and Verification	Limits in Treatments
Plume centerline temperature	Page 23	Yokoi [1960]; Beyler [1986]	Vertical extent of ZOI	Alcohol lamp assumed to effectively be a fire with a diameter ~0.1 m.	NUREG 1824 [2007] Volume 3; Heskestad [2008]	Area source fires with aspect ratio ~ 1. Used with plume flux correlation; most severe of the two is used as basis for the ZOI dimension.
Hydrocarbon spill fire size	Page 51	Gottuk et al. [2002]	Determine heat release rate for unconfined hydrocarbon spill fires.	Hydrocarbon spill fires on concrete surfaces ranging from ~1 to ~10 m in diameter.	None. Based on limited number of observations.	None. Transition from unconfined spill fire to deep pool burning assumed to be abrupt.
Flame extension	Page 100	Lattimer [2002]	Determine the fire offset for open panel fires.	Corner fires ranging from ~10 to ~1,000 kW. Fires included gas burners and hydrocarbon pans.	None. Based on limited number of observations.	None. Offset is assumed equal to the depth of the ceiling jet from the experiments.
Line source flame height	Page 101	Delichatsios [1984]	Determine the vertical extent of the ZOI	Theoretical development.	Lattimer [2008]	None. Transition to area source assumed for aspect plan ratios less than 4. Maximum of area and line source predictions used in this region.
Corner flame height	Page 108	Lattimer [2002]	Determine the vertical extent of the ZOI	Corner fires ranging from ~10 to ~1,000 kW. Fires included gas burners and hydrocarbon pans.	None. Correlation form is consistent with other methods; comparison to dataset from Lattimer [2002] provides basis.	None.
Air mass flow through opening	Page 140	Kawagoe [1958]	Compare mechanical ventilation and natural ventilation	Small scale, 1/3 scale, and full scale single rooms with concrete and steel boundaries. Vent sizes and thus opening factor varied. Wood crib fuels.	Drysdale [1999]; SFPE [2004]	None. SFPE [2004] spaces with a wide range of opening factors.

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Correlation	Location in Treatments	Original Reference	Application	Original Correlation Range	Subsequent Validation and Verification	Limits in Treatments
Line fire flame height	Page 210	Yuan et al. [1996]	Provides a limit on the use of the Zone of Influence (ZOI); Extent of ZOI for cable tray fires.	$0.002 < \frac{Z}{\dot{Q}'} < 0.6$ In practice, from the base to several times the flame height from 0.15 – 0.5 m wide gas burners.	None. Correlation form is consistent with other methods; comparison to dataset from Yuan et al. [1996] provides basis	None.
Cable heat release rate per unit area	Page 210	Lee [1985]	Provides assurance that the method used is bounding	Cables with heat release rates per unit area ranging from about 100 – 1000 kW/m².	None.	Correlation predicts a lower heat release rate than assumed in the Treatments and is based on test data.
Line fire plume centerline temperature	Page 212	Yuan et al. [1996]	Provides a limit on the use of the Zone of Influence (ZOI); Extent of ZOI for cable tray fires.	$0.002 < \frac{Z}{\dot{Q}'} < 0.6$ In practice, from the base to several times the flame height from 0.15 – 0.5 m wide gas burners.	None. Correlation form is consistent with other methods; comparison to dataset from Yuan et al. [1996] provides basis	None.
Ventilation limited fire size	Page 283	Babrauskas [1980]	Assessing the significance of vent position on the hot gas layer temperature	Ventilation factors between 0.06 – 7.51 Fire sizes between 11 – 2800 kW Wood, plastic, and natural gas fuels	SFPE [2004]	None. Provides depth in the analysis of the selected vent positions.

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HNP RAI 5-3

NFPA 805, Section 2.4.1.2.3, "Validation of Models," requires the verification and validation (V&V) of all fire models used in the associated analysis. Additionally, NFPA 805, Section 2.7.3.2, "Verification and Validation," and Section 2.7.3.3, "Limitations of Use," provide detailed requirements for the V&V and limitations of use for applicable fire models.

Section 4.5.2 of the Harris Transition Report states:

> *The approach taken at HNP to simplify the analysis process incorporates features of several fire model tools covered by NUREG-1824 as well as additional features. The approach is collectively referred to as the Fire Modeling Generic Treatments. The analysis basis and V&V documentation was provided in a proprietary Hughes Associates, Inc. report to the NRC on January 24, 2008. The report entitled "Generic Fire Modeling Treatments" is effectively a technical reference guide, a user's guide, and the V&V basis.*

Please provide assurance that the fire models and correlations identified in "Generic Fire Modeling Treatments" were applied within their appropriate scopes and limitations.
In addition, please provide a more detailed description of the V&V status for the applied fire models and correlations at HNP. One approach would be to note the consistencies and inconsistencies of the HNP V&V efforts with American Society for Testing and Materials (ASTM) E1355-05a, "Standard Guide for Evaluating the Predictive Capability of Deterministic Fire Models," and justify the inconsistencies. Other approaches for judging the V&V status of the applied models and correlations may also be acceptable.

Response: In addition to the summary of the correlations used, as presented in Table RAI 5-2(a) of HNP's response to HNP RAI 5-2 (above), Table RAI 5–3(a) provides a cross reference between major sections of ASTM E 1355–05a and the correlations in terms of their applicability and their validation. The FDT's, CFAST, and FDS have been subjected to V&V per Nuclear Regulatory Guide (NUREG) 1824 (2007), "Verification & Validation of Selected Fire Models for Nuclear Power Plant Applications" and have been used within their appropriate scopes and limitations.

The modification of the zones of influence of electrical panels with vertical vents, as described in HNP-M/MECH-1196, is based on a paper by Yokoi. The paper derived methods to predict the trajectory of a plume from a vertical vent due to a fire in the space. The paper compared the analytical results with both model and full scale fire tests. The following conclusions were that the analytical method closely agreed with the results of the full scale fire testing.

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1) In the case where there is no wall above the opening, the trajectory depends only on the vertical length of openings and is independent of horizontal lengths.

2) In the case where there is a wall above the opening, the ejected hot gas rises closely to the wall and position of the above mentioned trajectory must be corrected.

3) The slenderer the shape of the opening becomes in the horizontal direction, the more the hot gas rises closely to the wall, and the larger becomes the value of correction.

The paper also developed a method for predicting the temperature distribution of hot gas exiting a vertical vent. It was assumed that the dimensions of the vent and the heat release rate from the vent are known. The analytical results were compared with the results of full scale fire tests. The conclusions reached were that the analytical results could be applied to the results of full scale fires at least within the trajectory distance of 6 to 7 meters.

Table RAI 5–3(a) – ASTM E 1355–05a Compliance Matrix Cross Reference for Generic Treatments Correlations.

Correlation	ASTM E 1355–05a Section					
	Section 7.1 Model (Correlation) Documentation	**Section 7.2** Scenarios for which Model has been validated	**Section 8** Theoretical basis for model (correlation)	**Section 9** Mathematical and Numerical Robustness	**Section 10** Model (Correlation) Sensitivity	**Section 11** Model Evaluation and **Section 12** Evaluation Report
Flame Height	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5–2(a)	Closed form solution; singularity at negative $\dot{Q}$; Flame heights restricted to real, positive values.	Sensitivity over range of parameters considered in Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008
Point Source Model	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5–2(a)	Closed form solution; singularity at negative $\dot{Q}$ or $\dot{q}''_c$; R restricted to real, positive values.	Sensitivity over range of parameters considered in Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008

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Correlation	ASTM E 1355–05a Section					
	Section 7.1 Model (Correlation) Documentation	**Section 7.2** Scenarios for which Model has been validated	**Section 8** Theoretical basis for model (correlation)	**Section 9** Mathematical and Numerical Robustness	**Section 10** Model (Correlation) Sensitivity	**Section 11** Model Evaluation and **Section 12** Evaluation Report
Method of Shokri and Beyler	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5-2(a)	Closed form solution; singularity at negative $\dot{q}_c''$; R restricted to real, positive values.	Sensitivity over range of parameters considered in Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008
Method of Mudan (and Croce)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5-2(a)	Closed form solution; singularity at negative D_e; R restricted to real, positive values.	Sensitivity over range of parameters considered in Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008
Method of Shokri and Beyler	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5-2(a)	Closed form solution; singularity at negative D_e; R restricted to real, positive values.	Sensitivity over range of parameters considered in Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008
Plume heat fluxes	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5-2(a)	Closed form solution; singularity at negative $\dot{q}_c''$; R_H restricted to real, positive values.	Sensitivity over range of parameters considered in Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008
Plume centerline temperature	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5-2(a)	Closed form solution; singularity at negative $\dot{Q}$ or ΔT_{CL}; R_H restricted to real, positive values.	Sensitivity over range of parameters considered in Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008

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Correlation	ASTM E 1355–05a Section					
	Section 7.1 Model (Correlation) Documentation	**Section 7.2** Scenarios for which Model has been validated	**Section 8** Theoretical basis for model (correlation)	**Section 9** Mathematical and Numerical Robustness	**Section 10** Model (Correlation) Sensitivity	**Section 11** Model Evaluation and **Section 12** Evaluation Report
Hydrocarbon spill fire size	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5-2(a)	Closed form solution with no singularities; fire size restricted to real, positive values.	One-to-one linear input mapping; not sensitive to inputs.	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008
Flame extension	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5-2(a)	Closed form solution with no singularities; flame extensions restricted to real, positive values.	One-to-one linear input mapping; not sensitive to inputs.	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008
Line source flame height	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5-2(a)	Closed form solution; singularity at negative $\dot{Q}'$; F_H restricted to real, positive values.	Sensitivity over range of parameters considered in Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008
Corner flame height	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5-2(a)	Closed form solution; singularity at negative $\dot{Q}$ or D_e; F_H restricted to real, positive values.	Sensitivity over range of parameters considered in Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008
Air mass flow through opening	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5-2(a)	Closed form solution; singularity at negative vent height; $\dot{m}_{air}$ restricted to real, positive values.	One-to-one non-linear input mapping; not sensitive to inputs	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008
Line fire flame height	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5-2(a)	Closed form solution; singularity at negative $\dot{Q}'$; F_H restricted to real, positive values.	Sensitivity over range of parameters considered in Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008

Correlation	ASTM E 1355–05a Section					
	Section 7.1 Model (Correlation) Documentation	Section 7.2 Scenarios for which Model has been validated	Section 8 Theoretical basis for model (correlation)	Section 9 Mathematical and Numerical Robustness	Section 10 Model (Correlation) Sensitivity	Section 11 Model Evaluation and Section 12 Evaluation Report
Cable heat release rate per unit area	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5-2(a)	Closed form solution with no singularities; fire size restricted to real, positive values.	One-to-one linear input mapping; not sensitive to inputs	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008
Line fire plume centerline temperature	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5-2(a)	Closed form solution; singularity at negative $\dot{Q}'$ or Z; T_P restricted to real, positive values.	Sensitivity over range of parameters considered in Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008
Ventilation limited fire size	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008	Table RAI 5–2(a)	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008 Table RAI 5-2(a)	Closed form solution; singularity at negative vent height; $\dot{Q}_v$ restricted to real, positive values.	One-to-one non-linear input mapping; not sensitive to inputs	Generic Fire Modeling Treatments, Rev. 0, 1/15/2008

HNP RAI 5-4

NFPA 805, Section 2.7.3.4, "Qualification of Users," states:

> *Cognizant personnel who use and apply engineering analysis and numerical models (e.g., fire modeling techniques) shall be competent in that field and experienced in the application of these methods as they relate to nuclear power plants, nuclear power plant fire protection, and power plant operations.*

Please describe what constitutes the appropriate qualifications for the HNP engineers to use and apply the methods and tools included in the engineering analyses and numerical models. In addition, please discuss the licensee's process/procedure for ensuring adequate qualification of the personnel performing the fire analyses and modeling activities.

Response: Progress Energy has qualification standards established for the various engineering functions. There are currently two separate "Training Guides (qualification card)"

for PSA engineers, one for general PSA and one for Fire PSA. There are also "Training Guides (qualification card)" for Fire Protection and Safe Shutdown engineers. Engineering products such as calculations require signoffs by qualified engineers.

The Progress Energy qualification and training program is accredited by INPO.

HNP RAI 5-5

NFPA 805, Section 2.4.1.4, "Defining the Fire Scenario," requires that fire scenarios consider all operational conditions of the plant, and other characteristics as necessary, when demonstrating the capability to meet the performance criteria.

NFPA 805, Section 2.4.1.4(c), "Plant Area Configuration," states:

> *The area, zone, or room configuration shall consider the plant construction surrounding the area, area geometry, (e.g., volume, ceiling height, floor area, and openings), geometry between combustibles, ignition sources, targets, and surrounding barriers.*

Of specific concern are fire location corner and wall proximity effects, which can affect entrainment and flame height, as well as ZOI and target impacts.

Please address how the effects of fires located near corners and walls were accounted for in the HNP analyses; specifically in the Fire Modeling Generic Treatments and the discussion of the CFAST model in NED-M/MECH-1006, "Generic Fire Modeling Treatments." In addition, for specific ignition sources identified as being in close proximity to walls and/or corners, the licensee should describe the data collection account for such cases.

Response: The initial data collection walkdowns selected targets based on predetermined zones of influence (ZOI) for the sources. The ZOIs are based on a set of heat release rates (HRR) applicable to the various source types. These ZOI were determined in calculation HNP-M/MECH-1129, Rev.0. Per this calculation, the HRR for sources near walls or corners were multiplied by 2 and 4 respectively and separate ZOIs were generated for each. NED-M/MECH-1006 also provides adjustments for walls and corners, although this document was developed after the Harris PRA walkdowns were complete.

It should be noted that this treatment for walls and corners is based on open fires and is expected to give conservative results for most of the fires being evaluated. It is most appropriate for screening or scoping analysis.

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HNP RAI 5-6

NFPA 805, Section 2.4.1.2.1, states that "only fire models that are acceptable to the authority having jurisdiction shall be used in fire modeling calculations."

During the onsite regulatory audit at HNP, fire models were identified as having been used for special purposes in specific fire areas, as well as for the modification of damage criteria. However, the methods, input data, models, and verified and validated results are not explained in sufficient detail in Section 4.5.2 of the Harris Transition Report for the NRC staff to properly evaluate this issue. Accordingly, please address the following:

a. Provide detailed descriptions of these features for the following rooms/ areas:

- *Chiller Room Analysis (HNP-M/MECH-1140)*
- *PIC Room Analysis (HNP-M/MECH-1193)*
- *Cable Spread Room (HNP-M/MECH-1195)*
- *Switchgear Room "B" (HNP-M/MECH-1196)*
- *Switchgear Room "A" (HNP-M/MECH-1197)*
- *Motor Control Center (MCC) Fire Analysis (HNP-M/MECH-1207)*
- *Cable Damage Calculation (HNP-M/MECH-1194)*

Response 5-6 a: Specific details regarding the inputs, data, models, and verified and validated results for each of the HNP calculations listed above are discussed in the respective source documents that have been included as part of this RAI response submittal. A brief discussion for each calculation is provided below.

Chiller Room Analysis - (HNP-M/MECH-1140)
The calculation used NUREG-1805, Fire Dynamics Tools (FDTs) Quantitative Fire Hazard Analysis Methods, to determine the impact of a lube oil spill fire associated with Chillers WC-2(1A-SA) and WC-2(1BSB). This calculation determines if the maximum expected fire scenario from a possible oil spill can propagate to or damage overhead cable trays.

The following specific FDT's worksheets were used in the analysis:

- 03_HRR_Flame_Height_Burning_Duration_Calculations.xls
- 09_Plume_Temperature_Calculations.xls

The FDT's have been subjected to V&V per Nuclear Regulatory Guide (NUREG) 1824 (2007), "Verification & Validation of Selected Fire Models for Nuclear Power Plant Applications," and have been used within their appropriate scopes and limitations in this analysis.

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PIC Room Analysis - (HNP-M/MECH-1193)
The analysis used the zone-type computer model Consolidated Fire and Smoke Transport (CFAST) version 6.0.10.61027 to calculate enclosure temperatures in the PIC Room.
The goal of this calculation was to summarize the minimum fire sizes in the Process Instrument and Control (PIC) Room that could produce a hot gas layer temperature of 66°C (150°F) within thirty minutes under the most adverse ventilation conditions and various initial enclosure temperatures. The minimum fire sizes are presented as a function of fire base height to maximize the applicability of the calculation.

Based on a review of the documentation, data, and analysis provided by other researchers [Ref. 2.5 and Ref. 2.20], the use of the CFAST model for calculating temperatures in the PIC Room is within the capability and limitation of the model. The model is expected to give reasonably accurate answers, although there are indications that CFAST tends to over predict the upper layer temperature, which results in a conservative analysis.

Flame Spread Rate Along a Cable Tray – (HNP-M/MECH-1195)
NUREG-1805 and IMC 0609 data was used in conjunction with horizontal flame spread correlations as documented in: *Fire Hazard Assessment of Exposure to Safe Shutdown Raceways, St. Lucie Unit 1. Chapter 6. Hughes Associates, Inc. November 2001. Attachment 3 to ADAMS accession number ML013390436*".

The method used for calculating flame spread rate (HNP-M/MECH-1195) is a departure from NUREG-6850, where a methodology is employed that is dependent on the thermo physical properties of specific heat, thermal conductivity, density, "ignition temperature" as well as the phenomenological values of incident heat flux from the flame to the fuel (cable) surface and the "heated fuel distance" (which is selected by engineering judgment). Because the thermo physical properties for Kerite FR cables are not available in published sources and alternate research is available, an empirically-based method with the single variable of heat release rate was selected.

SWGR "B" Room - (HNP-M/MECH-1196)
The goal of the calculation was to determine the HGL temperature for a various fire scenarios involving ignition sources that burned for 60 minutes. The time that the HGL reached 400°F was of particular interest because that was the assumed failure temperature of the targets. CFAST was used in conjunction with a post-processing routine as part of the analysis. See the response to HNP RAI 5-6 (c) (below) for information related to the revised ZOI for specific electrical cabinets that exhibit vent plume characteristics. Input characteristics to the analysis were varied as part of the sensitivity study such as:

- Compartment ventilation characteristics
- Ignition source location (height above the floor)

The source-target relationship was evaluated to determine if flame propagation was likely as part of the HGL analysis. Incident radiant exposure and direct flame/plume impingement were considered. Further details can be found in the calculation.

SWGR "A" Room - (HNP-M/MECH-1197)
This calculation was very similar to HNP-M/MECH-1196 except that due to a different ignition source-target relationship, the modified plume trajectory analysis and radiant heat flux assessment was not necessary. The calculation used CFAST to determine HGL temperatures after a 60 minute burning period.

Motor Control Center (MCC) Fire Analysis - (HNP-M/MECH-1207)
This calculation was used to determine the general fire induced flow characteristics within a motor control center (MCC) resulting from a single cubicle fire scenario and to provide guidance for limiting fire induced multiple spurious operations (MSO's) in MCC cubicles of interest.

An internal examination of an MCC cabinet, and subsequent FDS fire modeling, resulted in the development of a proposed modification to limit MSO's of equipment with controls located in the cabinet. Internal ventilation conditions and physical construction was used to assess the conditions likely to be seen in an MCC enclosure. FDS was used within the bounds of its applicability as identified in NUREG-1824 to supplement the guidance developed in the calculation. Additionally, data from the CAROLFIRE tests was used for further insight.

Cable Damage Calculation - (HNP-M/MECH-1194)
This calculation was used to compute the time at which cables suspended over a burning electrical cabinet are damaged according to NUREG-6850 guidance and criteria. The FDT's were used for determining centerline plume temperatures. This data, in conjunction with NUREG-6850 Appendix H cable endurance times for cables at various elevated temperatures, was used to form a basis for a composite calculated damage time for targets are varied elevations above several different ignition source fire sizes.

b. *Describe the extent to which fire modeling was used to draw conclusions by utilizing different criteria and modeling techniques than those described in NUREG/CR-6850, "EPRI/NRC-RES [Research] Fire PRA Methodology for Nuclear Power Facilities."*

   Address the following:

   - *Zones of influence*
   - *Target determination*
   - *Ignition source impact as it differs from that outlined in NUREG/CR-6850 and/or Generic Fire Modeling Treatments"*

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Response 5-6 b: Fire modeling was used extensively for determining the zones of influence of postulated fire scenarios and for determination of the critical fire size needed for HGL formation in the various compartments of interest. In general, the criteria and modeling techniques referenced in NUREG-6850, and the "Generic Fire Modeling Treatments", have been the primary tools used to develop the Fire PRA analysis.

Some further refinements and/or treatments are listed below:

- See the response to HNP RAI 5-6 (c) for information related to the revised ZOI for specific electrical cabinets that exhibit vent plume characteristics.

- An internal examination of an MCC cabinet, and subsequent FDS fire modeling, led to the development of a proposed modification to limit multiple spurious operations (MSO's) of equipment with controls located in the cabinet. Internal ventilation conditions and physical construction was used to assess the conditions likely to be seen in an MCC enclosure. FDS was used within the bounds of its applicability as identified in NUREG-1824.

- The method used for calculating flame spread rate (HNP-M/MECH-1195) is a departure from NUREG-6850, where a methodology is employed that is dependent on the thermo physical properties of specific heat, thermal conductivity, density, "ignition temperature" as well as the phenomenological values of incident heat flux from the flame to the fuel (cable) surface and the "heated fuel distance" (which is selected by engineering judgment). Because the thermo physical properties for Kerite FR cables are not available in published sources and alternate research is available, an empirically-based method with the single variable of heat release rate was selected.

c. *Provide an explanation of the post-processing routine used to further characterize data that is obtained from the CFAST model as a means to ascertain fire induced flow effects from the electrical equipment.*

Response 5-6 c: HNP-M/MECH-1196 evaluated the propagation or cable damage of targets above select electrical cabinets by calculating the temperature of the exposing vent plume at the target cable tray positions using methods presented Yokoi, S., "Study on the Prevention of Fire Spread Caused by Hot Upward Current," Report Number 34, Building Research Institute, Tokyo, Japan, 1960. The vent mass flows, external burning, and gas temperatures are determined using the zone model CFAST and subsequently used as inputs to the plume trajectory correlation.

d. *The hot gas layer was calculated using models different from those referenced in NUREG/CR-6850. Provide sufficient detail to delineate what models were used to calculate the hot gas layer (as described in calculation HNP-M/MECH-1128) and zones of influence (as described in calculation HNP-M/MECH-1129).*

Response 5-6 d: The heat release rate necessary to generate a hot gas layer with a temperature similar to the damage criteria of a target was estimated using the McCaffrey, Quintiere and Harkleroad (MQH) correlation. This correlation requires the specification of the room geometry and natural ventilation. For closed compartment consideration, the method of Beyler was used and the most conservative result was used for Fire PRA and screening applications. Additionally, Appendix H of NUREG 6850 provides data for quantifying the period of immersion in hot gases required for heat from the gas to conduct into the target cable, thereby degrading or igniting it. The time from exposure to damaging conditions (e.g., hot gas layer) to the time of actual damage from these conditions is referred to as "heat soak time." Crediting this heat soak time resulted in a slightly more refined, yet still conservative, screening tool for use in the Fire PRA. Since the credit of heat soak time is not a simple additive measure, a mathematical method of properly crediting this phenomenon is presented in HNP-M/MECH-1128.

HNP-M//MECH-1129 used the FDT's, within the acceptable bounds that they have been V&V'd per NUREG 1824, to determine screening ZOI values to support the development of the Fire PRA. ZOI information pertaining to thermoplastic and thermoset cables was presented with consideration for fire locations near walls and corners.

HNP RAI 5-7

The plant configuration that yields the baseline Fire PRA results is not clearly identified. Specifically, the licensee's submittal does not identify if there are any plant modifications or procedure changes, implemented in the plant but not necessarily reflected in the PRA model, which are used to generate the PRA results that support the NFPA 805 LAR.

Further, since a November 2010 implementation date is identified in the LAR, any plant modifications or procedure changes planned to be implemented by this date, but not currently reflected in the PRA model, need to be identified. If any such plant changes exist, they must be discussed and dispositioned as not significantly impacting the PRA results presented to support the existing basis of the HNP NFPA 805 LAR. Note that this requirement encompasses non-fire modifications, as well as the proposed fire modifications, discussed in the LAR.
Please provide an additional discussion to adequately address the issue(s) outlined above.

Response: Modifications planned to be implemented as part of transition were included in the FPRA used to support the LAR. Additional modifications which arise before or during implementation will be evaluated consistent with the change evaluation process identified in the LAR. If PRA results are impacted specific approval may be required.

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HNP RAI 5-8

In the discussion of the technical adequacy of the Fire PRA in Attachment X, "Fire PRA Quality," of the Harris Transition Report, Table X-2, "HNP Summary of Evaluated Capability," identifies the capability category for each aspect of the HNP Fire PRA.

However, Table X-2 is unclear on the identification of the specific criteria upon which this capability assessment is based (i.e., is it simply reflecting NRC staff review results, focused scope peer review results, or the results of a licensee self-assessment). The technical basis upon which the capability of the HNP Fire PRA is judged must be clearly identified. Please provide an additional discussion to adequately address the issue(s) outlined above.

Response: The first two columns of table X-2 provided the grade given by the reviewers. The industry review focused on SRs unreviewed by the NRC, SRs graded below Cat 2 by the NRC, and Progress Energy responses to NRC F&Os. In the case of the industry review, the goal was specifically identified as Cat 2 (when applicable). If the SR did not meet Cat 2, an F&O was generated for the specific issue preventing Cat 2. The last column is Progress Energy's assessment of current capability category based on addressing the F&Os.

HNP RAI 5-9

Section 4.0, "Assumptions," of calculation HNP-F/PSA-0079, Revision 1, identifies assumptions used in the development and quantification of the Fire PRA model. However, several of these assumptions, used to support the HNP NFPA 805 application, do not appear to have an appropriate basis identified. The NRC staff requires additional information to assess the appropriateness of these Fire PRA assumptions. Accordingly, please address the following:

a. *Assumption 4 – It is assumed that detection of a fire will occur within 15 minutes, even with no operational detectors available. This assumption would only be warranted if the fire causes some type of alarm or other operational upset condition that would be detectable in the control room such that personnel would be dispatched to the area of the fire to investigate.*

Response 5-9 a: Assumption 4 - Security patrols and other routine plant work tasks provide periodic occupancy in most areas of the plant on sufficiently high frequency such that 15 minutes is a reasonable time when the obvious consequences of a fully developed fire (such equipment issues and smoke) would be detected.

b. *Assumption 5 – It is assumed that a fire watch is 100 percent effective in preventing fires from developing to the point of a hot gas layer (HGL). This assumption is too broad as written, since periodic fire watches would not be expected to be 100 percent effective, and even a continuous watch in a particular area may not be able to prevent all types of fires that could ultimately lead to formation of a HGL.*

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Response 5-9 b: Assumption 5 - The assumption is only intended to apply to a continuous fire watch. The FPRA took no specific credit for roaming fire watches.

c. *Assumption 6 – It is stated as an assumption that "continuous fire watch personnel will take first action to suppress an observed fire". It is unclear to the NRC staff what entails the intent and affect of this assumption.*

Response 5-9 c: Assumption 6 - The responsibilities and training of the fire watch involve the capability to suppress the fire as opposed to only notifying the Control Room to dispatch the fire brigade.

d. *Assumption 7 – It is assumed that in the absence of a detailed circuit analyses, any fire with a target set causes a plant trip with loss of feedwater; it is then stated that this assumption may be set aside under some conditions. The statement regarding application of a conditional trip probability is not clear as to its specific meaning or intent, and appears to contradict the first part of this assumption. Further, Table 1 in the body of calculation HNP-F/PSA-0079 identifies conditional probabilities of plant trip as being pervasive, such that this assumption does not appear to be a common assumption.*

Response 5-9 d: Assumption 7 - If it is known that there are no cables or equipment in an area that will cause a plant trip, a detailed circuit analysis is not required. Also, if there are no scenarios identified that impact any targets other than the fire source, then it seems reasonable that the likelihood of a plant trip is reduced.

e. *Assumption 8 – It is assumed that cable trays in the ZOI are stacked above the source; however, it is not stated whether or not this assumption is conservative. If it is not conservative, this assumption should be addressed by appropriate sensitivity studies.*

Response 5-9 e: Assumption 8 - This statement is conservative in that there can be trays identified that are on the edge on the horizontal ZOI. While the tray is assumed to be damaged it is not likely that the tray will ignite as part of the cable tray fire above the source. The assumption is that this tray would ignite and contribute to the overall HRR used to assess HGL potential, which is conservative.

f. *Assumption 9 – It is assumed that MCCs are closed cabinets and internal cubicle fires will not propagate to external targets. The intent and proposed effect of this assumption is unclear, especially since it is either verifiably true or not true. In addition, no basis is provided for the second part of this assumption regarding faults which could cause the MCC to become an open configuration.*

Response 5-9 f: Assumption 9 - MCCs at HNP are closed with no vents and robust doors. A better sensitivity analysis will be performed to address the impact of the MCC opening due to an arc fault.

g. *Assumption 10 – It is assumed that walls and corners have no impact on electrical cabinet fire growth and propagation to the first target cables; however, it is not stated whether or not this assumption is conservative. If it is not conservative, this assumption should be addressed by appropriate sensitivity studies.*

Response 5-9 g: Assumption 10 - This assumption is not conservative, however sensitivity studies are not necessary due to other conservative assumptions such as source heat release rate and time to damage still providing overall conservative result.

HNP RAI 5-11

Section 8.1, "Hemyc and MT Delta-CDF and Delta-LERF," of calculation HNP-F/PSA-0081, Revision 0, identifies the application of a compartment-level and component-level screening criteria. However, this screening criteria is not addressed in Revision 1. Please clarify whether or not such a screening method is still employed. If so, provide the basis for acceptability of this screening approach to ensure that the reported delta-risk values are calculated appropriately (i.e., conservative and bounding considering the screening approach).

Response: Screening is not used. The delta CDF is determined by scenario and can be grouped by source, and compartment. The results are provided to the change evaluations and FSA calculations.

HNP RAI 5-13

Section 5.2.3, "Fire Zone Data," of calculation HNP-F/PSA-0079, Revision 1, states that "if the fire zone is continuously occupied a brigade response time of 2 minutes was applied."

While it might be expected that a human response to a fire would occur very rapidly in a continuously occupied zone, the time for the fire brigade to muster and respond, even if notified immediately, would likely be more than 2 minutes.

Accordingly, please discuss whether or not non-brigade response by personnel in the location undergoing the fire is being assumed to achieve the same level of success in terms of suppression effectiveness, etc., as a fire brigade response. If so, provide a justification for this conclusion as well as a discussion of the effect of assuming longer brigade response times.

Response: The 2 minute response time is based on a first response by the fire watch, not the actual fire brigade. The basis is that fire will be spotted while they are very small and suppressed or controlled rapidly. That is one of the functions of continuous fire watches during cutting and welding.

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6. Please provide the following information concerning the NFPA 805 monitoring program:

HNP RAI 6-1

NFPA 805, Section 2.6, "Monitoring," requires licensees to establish and monitor acceptable levels of availability, reliability, and performance for the fire protection systems and features. However, the material submitted regarding HNP's monitoring program, located in Section 4.6, "Monitoring Program," of the Harris Transition Report, contains insufficient detail for the NRC staff to properly evaluate this issue.

Please provide a detailed description of the monitoring program that will be used to assess acceptable levels of availability, reliability, and performance for the fire protection systems and features at HNP. The scope of the response should include an example or examples that demonstrate the process, as well as a schedule for completion of the monitoring program.

The examples and discussion for the HNP monitoring program should:

1. *Describe how HNP will identify the appropriate fire protection systems and features, and the attributes of those systems and features, which will be monitored.*

2. *Clarify what criteria will be used to assess acceptable levels of availability, reliability, and performance for each system/feature/attribute.*

3. *Clarify what method(s) will be used to monitor the availability, reliability, and performance of each system/feature/attribute.*

4. *Explain how unacceptable levels of availability, reliability, and performance for each system/feature/attribute will be managed.*

Please note that the NRC staff found, during the onsite regulatory audit at HNP, that the information contained in HNP transition procedure FPIP-0130, "NFPA 805 Monitoring," is at the appropriate level of detail to address this issue.

Section 4.6 of the Harris Transition Report indicates that the HNP monitoring program is currently under development and will be implemented as part of the fire protection program transition to NFPA 805. The NRC staff recognizes that the monitoring program is not required to be completed prior to the issuance of an SE approving the use of NFPA 805. However, the NRC staff should have the ability to review the process by which the monitoring program is being developed in order to ensure compliance with the related NFPA 805 requirements.

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Response:

The scope of the NFPA 805 Monitoring Program includes the following:

- Monitoring of Fire Protection Program Structures, Systems, and Components
- NSCA equipment and systems are generally monitored by the Maintenance Rule. It is anticipated that in most cases, for the NSCA type components, the existing Maintenance Rule performance goals will be bounding and that additional NFPA 805 performance goals will not be required. Any NSCA equipment and systems not considered under Maintenance Rule will be reviewed by the NFPA 805 Monitoring Expert Panel to determine if additional monitoring is required.
- Monitoring of Fire Protection Programmatic Elements
- Monitoring of Key Assumptions in Engineering Analyses

1. An Expert Panel will identify the fire protection systems and features, and the attributes of those systems and features that will be monitored by determining a complete listing of Pseudo-Systems and Performance Monitoring Groups (PMGs). Note that Pseudo-Systems and PMGs are Progress Energy defined terms that functionally relate individual SSCs within a system for performance monitoring purposes. The below Table identifies the initial scoping of Pseudo-Systems and PMGs as documented by the HNP NFPA 805 Monitoring Expert Panel. Changes to the PMGs could occur as part of NFPA 805 Implementation, and those changes will be documented in the Expert Panel Meeting Minutes.

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Initial Listing of Pseudo-Systems and PMGs

Pseudo-System	*Performance Monitoring Groups (PMGs)*				
Incipient Detection	In-Panel Incipient Detection				
Prompt Detection	Manned	Continuous Fire Watch			
Prompt Suppression	Manned	Hot Work Fire Watch			
Automatic Detection	FID, FUD and FAD Detection Zones (Channels)	FID, FUD and FAD Detectors (Individual Detectors)			
Automatic Suppression	Thermal Detection (FTD) Zones (Channels)	Thermal Detectors (FTD) (Individual Detectors)	Fire Water Supply	Isolation Valves	System Control Valves
Passive (Fixed)	Fire Barrier	Electrical Raceway Fire Barrier System (ERFBS)	Sumps and Dikes		
Manual Suppression	Fire Brigade Team	Isolation Valves	Hose Stations	Fire Extinguishers	Fire Equipment / Response Vehicle
Transient Combustibles	Procedure Violation				

FID: Fixed Ionization Detection; FUD: Fixed Ultra-Violet Detection; FAD: Fixed Air Detection; FTD: Fixed Thermal Detection.

2. The Fire PRA (FPRA) is the primary tool used to establish risk significance and performance bounding guidelines. The screening thresholds used to determine risk significant fire compartments are:

   - CDF ≥1E-7 or
   - LERF ≥1E-8 or
   - RAW ≥2

     - High Safety Significant Fire SSCs are those that support the risk significant fire compartment screening criteria, and all "systems" amenable to risk measurement are included for each fire compartment.
     - Low Safety Significant Fire SSCs continue to be maintained via existing programs/processes, i.e., what is already being done.

   Additionally, the Expert Panel may include other fire compartments that are not risk significant (per the FPRA screening criteria) but are included based on plant specific history and/or operational considerations.

3. Acceptable levels of availability, reliability and performance criteria is based primarily on FPRA insights and accepted industry guidance such as *EPRI/NMAC Technical Report 1006756 Fire Protection Equipment Surveillance Optimization and Maintenance Guide*. The method that will be used is a database called Plant Equipment Reliability Management Information Tool (PERMIT). PERMIT is used for Component Analysis and System Monitoring and is the tool used for documenting FPRA scoping, safety significant fire compartments, performance criteria, and performance monitoring data.

4. Functional Failure Criteria will be established by the Expert Panel based on the SSCs risk significant function.

   Action levels will be established for each PMG (an action level is a bounding value determined by the Expert Panel using input from industry guidelines and a FPRA impact review). The action level is determined based on the number of functional failures within a three-year rolling time period.

   Unacceptable levels of availability, reliability, and performance will be triggered by the established action levels. If an action level is triggered, the Expert Panel determines the Corrective Action criteria and action level adjustment if more than usual monitoring is warranted.

Documentation of the Monitoring Program during program implementation is contained in the Expert Panel Meeting Minutes.

Implementation of the Monitoring Program is part of the NFPA 805 program implementation, as discussed in the schedule found in Section 5.4 of the LAR.

7. Please provide the following information concerning program documentation, configuration control, and quality assurance:

HNP RAI 7-1

NFPA 805, Section 2.7.2.1, "Design Basis Document," discusses maintenance and control of the design basis document. However, as indicated in NEI 04-02, Section 5.1.1.1, "Program Documentation," NFPA 805 does not address the difference between the design basis document and the licensing basis document. Therefore, it is incumbent on HNP to clearly define what constitutes the licensing basis document. Accordingly, please:

a. *Provide a description of the process by which program documentation and configuration control will be maintained during the NFPA 805 transition process, as well as carried forward post transition.*

b. *Discuss the procedure/process that ensures configuration management and quality assurance during the NFPA 805 transition period.*

c. *Describe the process/procedure by which the licensing basis documentation will be managed post transition.*

d. *Describe how this process/procedure differs from the existing plant procedures for controlling licensing basis documentation.*

e. *Figure 4-8, "NFPA 805 Transition – Planned Post-Transition Documentation Relationships," of the Harris Transition Report, provides a flow diagram that shows relationships between various analyses and post transition documents. Identify specifically those documents that constitute the licensing basis for HNP post transition.*

Response: As noted in 4.7.1 of the LAR, compliance with 10CFR50.48(c) is documented in a group of formal engineering analyses. These analyses are produced in accordance with Progress Energy Procedure EGR-NGGC-0017, "Preparation and Control of Design Analyses and Calculations". This process provides the methods and requirements to ensure that design inputs and assumptions are clearly defined, results are easily understood by being clearly and consistently described, and that sufficient detail be provided to allow future review of the entire analyses. The process includes provisions for appropriate design and engineering reviews and approvals. The approved analyses are considered controlled documents, and are accessible via the plant's document control system. Being analyses, they are subject to review and revision consistent with the other plant calculations and analyses as required by the plant design change process.

Analyses associated with the PSA program are also issued as formal analyses, so they are subject to the same configuration control mechanisms as discussed above. In addition, they are also subject to additional peer reviews as required by ASME-ANS-RA-S-2008. Configuration control during the transition is maintained through the change evaluation process as described in project instructions FPIP-0100, "Fire Protection Initiatives Project - Project Controls" and FPIP-0128, "NFPA 805 Transition Change Evaluations". Deviations from the plant's current licensing bases are evaluated per this process, and those items that will be transitioned to the new program have been identified.

The process for control of the licensing basis will be incorporated into the plant change review process (see Figure Z-2 of the LAR). This process requires that all plant changes be reviewed for impact on the plant licensing programs (e.g. 50.59, fire protection security, quality assurance, etc). Those changes that are determined to potentially impact the fire protection program during the initial screening process will be reviewed under the fire protection program change process, FIR-NGGC-0010. The criteria for what constitutes an acceptable change will be based on the guidance provided in Appendices I and J of NEI 04-02 as modified in the new generic license condition (when issued).

The difference between the new process and the existing process will be the introduction of the review criteria from Appendices I and J of NEI 04-02.

The licensing basis documents consist of the following

- The Transition Report/LAR
- The NFPA 805 SER
- The Revised License Condition
- The revised FSAR, including documents incorporated by reference.

HNP RAI 7-2

The fire protection program manual is one of the principal documents governing the manner in which the fire protection program is implemented at HNP. Accordingly, please identify any changes that will be made to FPP-01, "Fire Protection Program Manual," as a part of the NFPA 805 transition process. In addition, describe the type of training that will be provided and identify the required recipients of the training necessary for this program change.

Response: Changes to FPP-001, Fire Protection Program Manual, will be compiled and incorporated under the Design Change process governed by procedure EGR-NGGC-0005, "Engineering Change". The engineering change package number is EC 67999, NFPA 805 Implementation, and FPP-001 will be listed as an affected document. The Design Change process includes a review that determines impact on plant training programs. At this time, it is known that training guides for the Fire Protection and Safe Shutdown Engineers will be impacted. The impact on the remaining training requirements will be determined during the review of the EC.

HNP RAI 7-3

NEI 04-02, Appendix C, "Fire Protection Program Design / Licensing Document Post Transition," states that "the existing FP Quality program should be transitioned as-is into the new NFPA 805 FP Program." Please describe any changes being made to the Fire Protection Quality Assurance Program at HNP as a part of the NFPA 805 transition process.

Response: In addition to editorial and administrative changes (i.e. replacing references to previous NRC guidelines with those associated with the NFPA 805 transition and ensuring the features required for a performance based program under NFPA 805 are addressed), the scope of the components and systems currently considered as following under the Fire Protection QA Program will be expanded to include those systems that are in the power block and are required by Chapter 4 of NFPA 805 (See RAI 2-2) as defined in section 9.5.1.2.2 (reference Attachment I of the LAR) for all future activities. This means that certain FP/SSA systems and features in the Waste Processing Building, Fuel Handling Building, and the Turbine Building that are required by NFPA 805 Chapter 4 will now fall under the Fire Protection QA program. As such, any future

modifications to these systems will be conducted under the design controls required by the QA program.

HNP RAI 7-4

The requirement to perform periodic assessments (audits) of the fire protection program currently resides within HNP's existing fire protection licensing basis. Please clarify whether or not this requirement will be carried over into the NFPA 805 licensing basis. If yes, discuss where in the NFPA 805 program documentation it will reside. If no, provide a justification for deleting this requirement. In addition, please discuss how the existing fire protection program audit requirements differ from those required to meet NFPA 805, Section 3.2.3(3), regarding procedures for reviews of fire protection program-related performance and trends.

Response: The existing requirement for periodic assessments is contained in Section 17.3.4.1.5 of the UFSAR which states:

> *Outside agency inspection and audit program*
> *a) An independent fire protection and loss prevention inspection and audit shall be performed at least once per 24 months either qualified offsite licensee personnel or an outside fire protection firm.*
> *b) An inspection and audit of the fire protection and loss prevention program shall be performed by an outside qualified fire consultant at intervals no greater than 36 months.*
> *c) Copies of the audit reports and responses to them shall be forwarded to the Vice-President – Harris Nuclear Plant and the Manager – Nuclear Assessment Section.*

These requirements are based on those first provided in Generic Letter 81-21 and are being revised as shown in Attachment R of the License Amendment Request.

There are two types of assessment activities that will take place. One type will be conducted to meet the requirements from section 2.2.10 of NFPA 805, which states:

> *2.2.10 Monitoring Program. A monitoring program shall be established to assess the performance of the fire protection program in meeting the performance criteria established in this standard.*

These types of assessments will be conducted in accordance with the criteria in the new section 9.5.1.4.2, Monitoring. The monitoring programs will typically be conducted by personnel involved in the administration of the fire protection program. This type of monitoring will meet the requirements of Section 3.2.3(3) of NFPA 805.
The second type of assessment will be performed by the Nuclear Oversight Department to ensure that the requirements of the fire protection program are being effectively implemented. This will be an independent overview of the program with the emphasis on ensuring the

administration of the performance based fire protection program is effectively implemented. Accordingly, the revised section in Attachment R will be reworded as follows:

> *"17.3.4.1.5 Outside Agency Inspection and Audit Program*
> *a) An independent fire protection assessment shall be performed at least once per 36 months using an outside (external to Progress Energy) qualified, (meeting Member grade qualifications of the SFPE) fire protection engineer."*